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13. ABSTRACT *(Maximum 200 words)*

Effective management of today's comprehensive and complex health care systems requires an integrated and future-looking approach, if these systems are to survive in today's turbulent political and economic climate. It is obvious that decisions must be made regarding the long-term health care planning strategy for Dewitt Army Community Hospital (DACH), as well as the local and regional systems that support it. Because the Department of Defense does not currently have a viable long-term planning strategy for military health care in the National Capitol Region (NCR), decisions at the regional level are difficult. The purpose of this project is three-fold. The first is to provide senior leaders with a single document that provides an overview of the current situation facing DACH, as it relates to the region, NCR and the Walter Reed Health Care System. The second purpose of this study is to offer several alternative scenarios outlining the best courses of action for the future health care planning of DACH. Finally, this report will make recommendations to senior leaders regarding the best possible options based on an economic analysis, current health care policy and health care facility renovation and replacement trends. Recommendations include first ensuring that the Mother-Baby Renovation project at Dewitt ACH remains high on the MEDCOM funding priority list. In addition, it is extremely important that a funding placeholder remains for the potential MILCON appropriation of $46 million dollars currently in the funding stream for a FY 04 project that is to be used for a major renovation to repair the numerous major structural, mechanical, electrical and functional defects well-documented by site survey master planning teams. Based on the provided economic analyses and facility assessment surveys, NARMC senior leaders should also support the immediate funding for a major renovation project at Dewitt within the next several years. Further integration of health care services in the NCR must become a priority for NARMC and all MTFs within the region. The question should not be should we integrate and consolidate our military systems, but the question should be when.

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A DECISION MODEL FOR SENIOR LEADERS: REINVENTING HEALTHCARE AT DEWITT ARMY COMMUNITY HOSPITAL

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Finally, I thank my family and friends for their unconditional support, love and understanding throughout these last two years, as well as during my career as an Army officer.

Abstract

Effective management of today's comprehensive and complex health care systems requires an integrated and future-looking approach, if these systems are to survive in today's turbulent political and economic climate. Although rightsizing has begun in the North Atlantic Regional Medical Command, most hospitals and clinics are operating at less than full capacity, in functionally obsolete facilities and with limited resources. Funding sources for large replacement hospitals in the military health system have been greatly reduced in an invigorated climate of downsizing and cost cutting.

It is obvious that decisions must be made regarding the long-term health care planning strategy for Dewitt Army Community Hospital (DACH), as well as the local and regional systems that support it. Because the Department of Defense does not currently have a viable long-term planning strategy for military health care in the National Capitol Region (NCR), decisions at the regional level are difficult. Commanders at military treatment facilities, such as DACH, need clear guidance in order to make strategic decisions regarding the future of their health care organization.

The purpose of this project is three-fold. The first is to provide senior leaders with a single document that provides an overview of the current situation facing DACH, as it relates to the region, NCR and the Walter Reed Health Care System. The second purpose of this study is to offer several alternative scenarios outlining the best courses of action for the future health care planning of DACH. Finally, this report will make recommendations to senior leaders regarding the best possible options based on an economic analysis, current health care policy and health care facility renovation and replacement trends.

Recommendations include first ensuring that the Mother-Baby Renovation project at Dewitt ACH remains high on the MEDCOM funding priority list. In addition, it is extremely important that a funding placeholder remains for the potential MILCON appropriation of $46 million dollars currently in the funding stream for a FY 04 project that is to be used for a major renovation to repair the numerous major structural, mechanical, electrical and functional defects well-documented by site survey master planning teams.

Based on the provided economic analyses and facility assessment surveys, NARMC senior leaders should also support the immediate funding for a major renovation project at Dewitt within the next several years. Further integration of health care services in the NCR must become a priority for NARMC and all MTFs within the region.

Finally, and in keeping with the MHS Strategic Plan, it is vital to the survival of our military health care system that senior leaders use cost/benefit analysis to determine when outsourcing and privatization are appropriate alternatives for achieving the MHS mission. The Defense Health Program continues to dwindle while the cost of health care skyrockets. The question should not be should we integrate and consolidate our military systems, but the question should be when.

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Introduction

Effective management of today's comprehensive and complex health care systems requires an integrated and future-looking approach, if these systems are to survive in today's turbulent political and economic climate. Management decisions that reflect consistency, wisdom and effectiveness are essential components of the well-run health care organization (Griffith, 1995). This approach is especially true of the military health care system. As Congress finds new ways to shrink defense spending, the Military Health System (MHS) is asked to bear the brunt of numerous fiscal cuts and must constantly focus on ways to make the organization more efficient. No where is this truer than in the process of facility life cycle planning for Army Medical Treatment Facilities (MTFs).

Facility life cycle integration for Army MTFs involves the coordinated and strategic business planning efforts of health facility planners, health economics and system analysts, and information management and technology planners. Currently, the U.S. Army Health Facility Planning Agency (USAHFPA) is the Army's proponent for medical facility planning and life cycle integration. The mission of the Facility Life Cycle Integration (FLCI) team is to develop and promote mission-based predictive sustainment and capital investments (U.S. Army Health Facility Planning Agency, 1999). The bottom line is to consistently put the right money at the right time into the right project in order to sustain and enhance existing medical facilities and replace those no longer mission capable.

FLCI consists of the following areas: 1) strategic planning and regional coordination: conducting market analyses and mission-based research in order to assist MTF's in developing their strategic business plans; 2) master planning: providing the leadership with a "road map" for business plan implementation, helping to match resources with requirements; 3) economic and

health care requirement analyses: analyses that allow leaders to evaluate alternative scenarios in order to make well-informed decisions; 4) operations development: assisting the MTF with a detailed, work-center specific, business re-engineering master planning efforts; and 5) Department of Defense (DoD) and U.S. Army Medical Command (MEDCOM) investment strategy execution: programming then prioritizing renovation and new construction projects based on annual funding in future year's programs (USAHFPA, 1999).

The need for an integrated master planning effort is especially evident in the National Capitol Region (NCR) due to the great number of facilities, a large and diverse population, multiple layers of tri-service management, and a growing retiree population. Many MTF's are in desperate need of repair, renovation or complete replacement. The question then arises for our senior leaders: What hospitals should be renovated, replaced or perhaps closed all together? These are not simple questions with simple answers. In the case of one community hospital in particular, the question is being raised once again.

Background

The U.S. Army Medical Command consists of six Regional Medical Commands (RMC) that are responsible for the care provided to soldiers, family members and retirees within the continental United States as well as Europe and the Pacific (see Figure 1). The RMC commanders are also responsible for strategic long-term planning that also includes health facility master planning for their region.

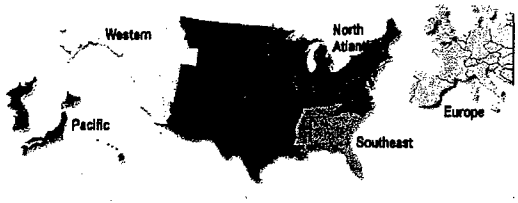


Figure 1. The U.S. Army Medical Command's Regional Medical Commands

DeWitt Army Community Hospital (DACH) is part of the DeWitt Health Care System (DHCS) and located at Fort Belvoir, Virginia. It falls under the command of the Walter Reed Health Care System (WRHCS), an integrated health care delivery system offering access to quality and comprehensive care to military families in and around the NCR. The DHCS consists of a network of community-based clinics in Northern Virginia (Figure 2) including the Family Health Center of Fort Belvoir, the Family Health Center of Fairfax, the Family Health Center of Woodbridge and the Andrew Rader U.S. Army Health Clinic at Fort Myer, Virginia.

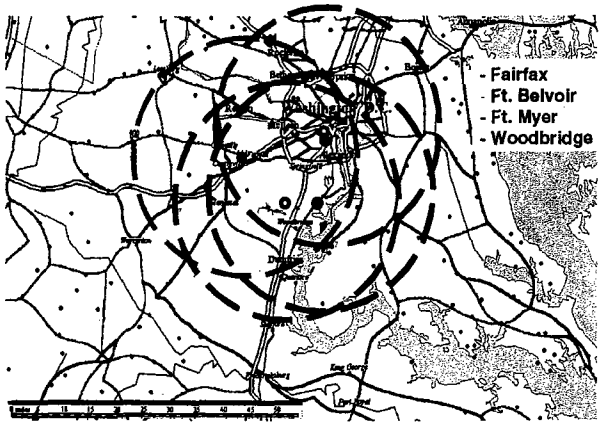


Figure 2. DeWitt Health Care System Catchment Area

The WRHCS also includes Kimbrough Ambulatory Care Center at Fort Meade, Maryland and Walter Reed Army Medical Center (WRAMC) in Washington, D.C. The hospitals and clinics within the WRHCS belong to the North Atlantic Region Medical Command (see Figure 3), the northeast subordinate command of the U.S. Army Medical Command.

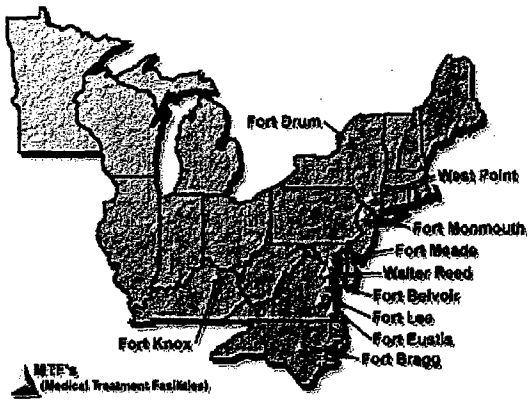


Figure 3. The North Atlantic Regional Medical Command

Currently, the DHCS serves as the largest primary care system in the WRHCS providing care for a population of over 120,00 users in the northeast. A breakout of user types is provided in Figure 4. Dewitt is also the largest military community hospital in the northeast DoD TRICARE region.

TRICARE is DoD's managed health care program that serves 8.3 million beneficiaries in which approximately 70% is direct care (care provided within military facilities) and the remaining 30% is contracted care (care provided by civilian network providers). TRICARE is an integrated health care delivery system that has enabled the DoD to provide better access to high quality and cost-effective care for more beneficiaries than the previous health care delivery modalities available in the MHS (TRICARE, 2000).

As a health plan, TRICARE offers a triple-option health benefit package providing beneficiaries a choice of: TRICARE Prime, an enrolled HMO like option; TRICARE Extra, a preferred provider option; and TRICARE Standard, the standard CHAMPUS option. All active duty service members are enrolled in TRICARE Prime (TRICARE, 2000).

A/D A/D FMs Retired Retired FM

Source: RAPS v 10.0.1

Figure 4. 1999 Demographics: 126,280 Users (All Services Combined)

The mission of DACH is to provide beneficiaries ready access to an appropriate level of quality, comprehensive health care. In addition, the organization provides both primary and specialty care within the WRHCS as well as a large referral base for higher level care to other medical centers in the NCR. It follows then that the future of health care delivery within the system depends heavily on the strategic health care planning of this vital health care organization, and a comprehensive and thoughtful consideration of the large capital investment required to either sustain or repair DACH.

DACH is a five-story 250-bed facility (Figure 5) that first opened in 1957 and was one of several hospitals built with congressionally designated FY53 funds following the Korean War. The 191,000 square-foot hospital was dedicated on June 26, 1957 and named after Brigadier Wallace DeWitt, a Medical Corps officer who served 45 years in the Army. The hospital featured nine wards and 53 semi-private rooms and boasted a daily census over 200. In the late 1960's a one-story clinic addition was built increasing the overall size to approximately 260,000 square feet.

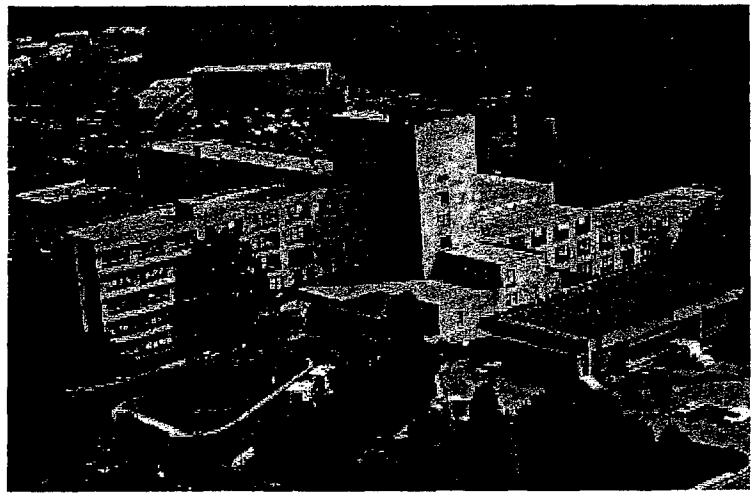


Figure 5. DeWitt Army Community Hospital

Today DACH operates four main inpatient areas (Medical/Surgical/Pediatric Unit, Mother-Baby Nursery Unit, Labor/Delivery Unit and Intensive Care Unit), an operating room, an emergency room, a small same-day surgery center and large primary and specialty care areas. Appendix A provides a detailed summary of services and current space utilization. Although the hospital has undergone quite a change in mission over the last 42 years, the overall functionality, appearance, and internal structure are relatively unchanged.

As a vital member of the WRHCS, DACH serves as the system's sole community hospital and provides medical services as part of TRICARE. DACH not only serves as a partner in the WRHCS, but also works closely with other military medical centers in the NCR, including the National Naval Medical Center (NNMC) in Bethesda, Maryland and Malcolm Grow Medical Center (MGMC) at Andrews Air Force Base, Maryland.

Conditions which prompted the study

The August 1998 Program Decision Memorandum (PDM) by the Deputy Secretary of Defense recommended that the Surgeons General of the Army, Navy, and Air Force develop a

Defense Health Program (DHP) reengineering implementation plan. The PDM included proposals to reengineer care management, recapture workload from contractors where appropriate, to reengineer clinic structure and operations to best practice ambulatory care standards, and to right-size military treatment facilities. In addition, the PDM included a recommendation to consolidate WRAMC and the NNMC, considering all DoD medical facilities and managed care support contractor capabilities in the NCR (Hamre, 1998).

Although rightsizing has begun in the NARMC, most hospitals and clinics are operating at less than full capacity, in functionally obsolete facilities and with limited resources. Funding sources for large replacement hospitals in the military health system have been greatly reduced in an invigorated climate of downsizing and cost cutting. In addition, Operation and Maintenance (O&M) dollars, which are used by the services to fund and execute major medical facility renewals, are not being adequately funded to support renewal program targets of reinvestment. USAHFPA investment strategy for FY 00 (Figure 6) represents the Military Construction (MILCON) and O&M funding balancing act necessary to adequately sustain, renew and replace the current medical facility inventory.

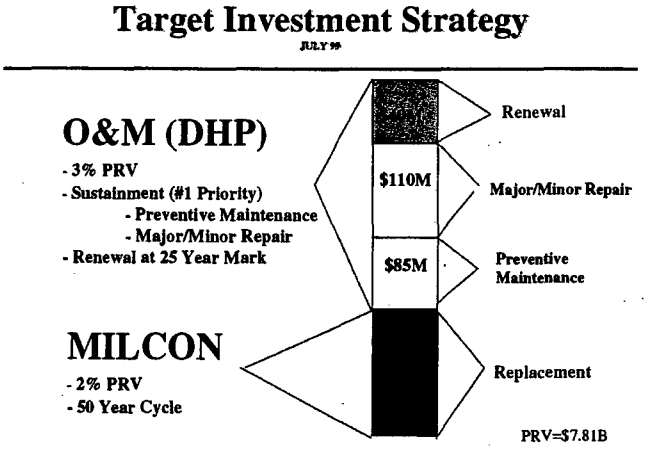


Figure 6. USAHFPA target Investment Strategy

In contrast, Figure 7 portrays the actual funding streams for health care facilities from 1989 through 2004. A September 1999 report on current military infrastructure by the Government Accounting Office (GAO) noted that "none of the services' RPM (real property

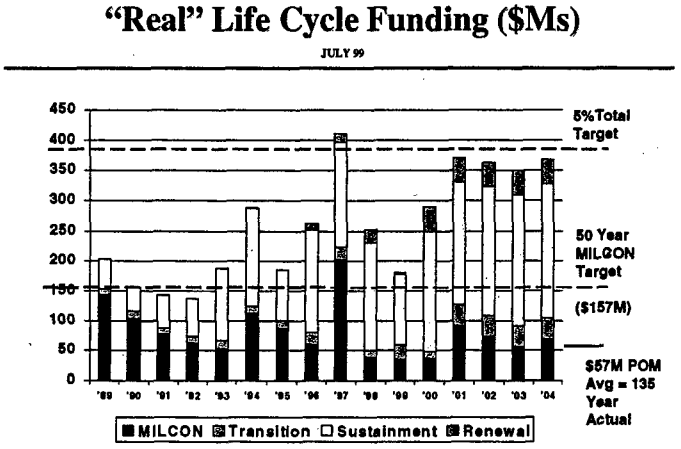


Figure 7. Actual facility life cycle funding.

maintenance) spending plans provide sufficient funding to keep their total backlog of repairs at current levels" (page 2). The report also reported how USAHFPA is implementing a life-cycle investment strategy that should reduce major repair costs by 50 percent with the implementation of targeted capital investments based on combined assessments of facility needs over a 50 year life-cycle of a building, known physical deficiencies and mission impact (Chan, Sharma and Tumin, 1999).

USAHFPA is committed in supporting DoD and MEDCOM's annual 5% Plant Replacement Value (PRV) target strategy for Army MTFs. Facilities are a health care system's single largest asset and therefore, facility protection (sustainment), enhancement (renewal), and capital investment planning (replacement) are imperatives for a responsive and successful health care system (USAHFPA, 1999). Based on current DoD funding decisions, it is essential for all Army senior leaders to become more committed to this endeavor.

Despite this steadily dwindling support of the necessary funding to ensure the cost effective use of the Army's $8 billion world-wide health facility infrastructure (which includes medical centers, community hospitals, health, dental, and veterinary clinics, and research and training facilities) DACH did recently receive FY 00 O&M approval for a $3.5 million renovation project of the third floor mother-baby unit, in an attempt to incrementally revitalize a 42-year old building. Although this is an important first step, the potential MILCON appropriation of $46 million dollars currently in the funding stream for a FY 04 project, may not be enough to fix the numerous major structural, mechanical, electrical and functional defects well-documented by site survey master planning teams (see Appendix C for full report).

A report based on the Regional Uniform Benefit Model (RUBM) analyzed population, staffing and facility use trends within the DHCS in May 1999 (Bristol, 1999). The model compares and validates medical personnel allocation in order to optimize the use of resources across a regional area. Specific recommendation were made to change staffing ratios in primary, specialty and inpatient care areas. In addition, it was noted that Dewitt was among the busiest of the MTFs in NARMC, especially those MTFs that make up the Walter Reed Healthcare System. The facility analysis noted that an addition or replacement project would be necessary to improve the hospital's ability to deliver quality care to its population (Appendix A).

In addition to the facility utilization study, a team from VW International, Inc. and Leo A. Daly conducted a field survey in 1998 in order to make visual observations of the current conditions of the hospital and as well as to assess the general condition of the mechanical, electrical, communications and fire alarm systems (Carr, Phillips, Thompson, and Rafshoon, 1998).

It was determined that many of the spaces within the facility were incompatible with currently assigned uses. The team noted that significant portions of the existing facility that were initially designed as inpatient facilities were being used for outpatient and/or administrative functions. They reported that the building configuration was not ideal for outpatient clinic functions and the facility was in need of internal redesign or new construction to create the best possible solution to accommodate clinic functions and improved departmental relationships. The team also noted that the existing building envelope was failing and therefore exposing structural elements to deterioration (Carr et al, 1998).

Statement of the Problem

It is obvious that decisions must be made regarding the long-term health care planning strategy for DACH as well as the local and regional systems that support it. Because DoD does not currently have a viable long-term planning strategy for military health care in the NCR, decisions at the regional level are difficult. In addition, the NARMC and the WRHCS are also without forward-looking and comprehensive health facility master plans that include the future revitalization strategy for DACH and other hospitals and clinics in the area. It should be noted that approximately 40% of the master planning process for WRAMC as well as facilities on the surrounding installation is now completed.

The 1998 Government Accounting Office (GAO) on Defense Health Care reported that the services use separate structures to plan and manage health care in the NCR at MTFs. The Army currently has 12 MTFs in the NCR that are centrally managed as part of the WRHCS. This particular system, as previously discussed is also part of a single regional command that covers 21 states and the District of Columbia. In contrast, only some of the Navy's 12 MTFs in

the NCR are under the direction of the Naval Medical Center in Bethesda, Maryland while the other clinics report to a Navy Health Support Office in Norfolk, Virginia. The Air Force has only one medical center in the NCR and then a clinic that separately reports to different major commands. Along with operating independently, each service has a complex command network that probably limits the ability of each service to coordinate resource sharing (Backus, Brand, Brier, Cox, Richardson, and Starck, 1999). These command and control factors add to the complexity of operating an integrated and optimized health care delivery system in the NCR.

In addition, the report also noted that DACH is the only NCR inpatient military facility in northern Virginia. Along with its 68-bed inpatient multi-service area, DeWitt provides a number of specialty services that includes a family medicine residency training program. The hospital and its surrounding clinics provide the primary medical support for several major Army commands that crosses service lines by providing obstetric and orthopedic services to Marines and their family members at the naval clinic in Quantico, Virginia (Backus et al., 1999).

These many geographical and system-related factors combine to make health facility planning at the MTF-level quite complicated in the NCR. Commanders at MTFs, such as DACH, need clear guidance from their senior leadership in order to make strategic decisions regarding the future of their health care organization.

Literature Review

The literature review consists of a search of current trends in the area of health facility planning, as well as key trends for future health care delivery systems.

Facility Trends.

Much of the current literature in health facility planning revolves around the need for changes in the way health facility planners do business. In a timely article on the "rightsizing" of hospitals, Fishback notes that the popular idea of a "center of excellence" has demanded the need for excessive facilities as measured both quantitatively and qualitatively in an attempt to demonstrate the facility's superiority (Fishback, 1999). Fishback (1999) also notes that the essential problem "is that high priority needs are often addressed with over-sized high cost solutions at the expense of a lower priority needs" (page 3). This fact need not be the trend for military health facilities.

In an attempt by military leaders to find ways to balance cost-effectiveness with access to quality care, Health Affairs has established a program of Specialized Treatment Services (STS) on both multi-regional and national levels. These STS centers are designated military or civilian facilities, based on readiness, access, quality and cost considerations. These centers are being utilized where high risk, complex and expensive medical procedures are carried out using the concentrated expertise and resources of the military. This "center of excellence" concept has lead to cost savings as well as greater access to specialty care within the Department of Defense military medical system (DoD 6015.1-M, 1999).

Others agree that little is being done to eliminate surplus capacity and redundancy in the health care system (Hayward, 1998). Newly merged systems must make difficult decisions regarding what to do with clinical programs and operation restructuring. Should facilities be abandoned, reconfigured or converted into smaller but better consolidated ones? Hayward (1998) also notes that the facility planning process historically focused on the wish lists of clinicians while ignoring the impact of operational costs. Hayward believes that an integrated

system must address the following issues during the planning phase of any health care facility project: 1) key clinical program integration/realignment issues; 2) redeploying staff and restructuring operations; and 3) reallocating scarce resources.

McKahan notes that health care organizations are no longer investing in the traditional patient care facilities of the past. Instead, hospitals are retooling their facilities in order to prepare themselves for the future (McKahan, 1998). Both new and renovated health care facilities are being created with a focus on a dramatic reduction in operating costs, in order to ensure they are prepositioned for managed care contracts. In addition, there are trends in rebuilding hospitals for an increasing outpatient population as well as the creation of facilities that increase customer satisfaction. Dewitt's current inpatient occupancy of 40% coupled with increasing primary and specialty care utilization rates as noted in Appendix A support this finding.

Tusler notes that the health care system is in the midst of two trends that influence decisions regarding future health care planning (Tusler, 1999). Tusler (1999) emphasized that one is the intense economic pressure of managed care and the second is "the freedom from the hospital bed that the new technologies have given us" (page 1). He goes on to state that an efficient, capitated, shared risk model, with a community health orientation may be the future vision for health care architecture. His model emphasizes the need for partnering with other health care providers and the efficient use of equipment and facilities in order to avoid duplication.

Various authors agree that the task of embarking on renovation projects involves analyzing alternatives and making wise management decisions. Kroll considered renovation opportunities and how they might compare with other options in her article on building

renovation economics (Kroll, 1999). She goes on to state that many buildings are renovated to achieve a financial objective, while others are restored for aesthetics reasons. However, her bottom line for renovation managers is to clearly define objectives. In the case of DACH, it is much more important to outline future objectives and goals for the project, before attempting to quantify needed but irrelevant intangibles such as facility aesthetics.

Kozlowski notes that major renovations take extensive planning, careful design and appropriate management in order to achieve economic success (Kozlowski, 1998). Costs must always be balanced with future paybacks. This balancing act within the MHS becomes even more difficult as funding sources evaporate while health care requirements increase.

Health Care Trends.

In a 1996 Fact Brief by the Advisory Board Company, the expansion of community hospitals services was addressed. The literature suggested that the establishment of relationships between community hospitals and referring physician providers provided a major opportunity for both (Advisory Board company, 1996). Likewise, expansion of specialty and sub-specialty services in a community hospital environment in order to increase a referral base from the surrounding community appeared to produce optimal results. Sharing services within a regional area may be an essential element of a healthy and strategically sound master planning effort for the NCR.

The question on many people's minds today is whether or not there are too many acute care hospitals in the health care system. This is especially true in the MHS. Military leaders must explain to Congress why consolidation efforts are seemingly at a stand still, while there appears to be an increase of health facility requests for facility renovations and replacements. Another author agrees that an integrated delivery system, especially systems of multi-hospitals,

are now rising in response to managed care (Havighurst, 1997). Havighurst points out that although market forces have changed the way health care organizations look at cost and efficiency, some organizations still have not found a way around the apparent but ill-defined capacity problem.

The NCR serves as a prime example of a similar and perplexing issue: how can the MHS consolidate three major medical centers, a large community hospital and numerous ambulatory health clinics without sacrificing the continuity of care, without decreasing the appropriate level of access, and without decreasing the overall level of patient satisfaction? Some may believe that the cost of maintaining over capacity is what really makes a system inefficient. However, Havighurst contends that the real costs of over capacity are not the actual costs of the beds (a sunk cost), but the inefficiencies associated with the management structure and the duplication of functions (Havighurst, 1997).

In a related article, it was emphasized how very important it is for current health care senior leaders to make appropriate resource allocation decisions based on the increased scrutiny by the Federal government (Connors and Hart, 1996). As military medicine continues its role as a key player in the current managed care system, leaders must strategically plan for the future of the organization. Dr. Sue Bailey, Assistant Secretary of Defense for Health Affairs, in a response to a November 1999 Government Accounting Office (GAO) report on defense health care, reported that the three Surgeons Generals are committed to concept of an integrated tri-service health system (Bailey, 1999). Integration of health care services should perhaps become a priority for all senior military health care leaders, especially those in the NCR.

Current MTF commanders must focus on the short-term budget process, while not neglecting long-term planning which may include the addition, expansion or deletion of services.

It is apparent that MTF commanders at the community hospital level, coexisting in a regional health care system, cannot make these types of major resource decisions in a vacuum. Strong senior leadership coupled with an outline of strategic regional health care planning goals must occur for integrated master planning to be effective.

Purpose of the Study

The purpose of this project is three-fold. The first is to provide senior leaders with a single document that provides an overview of the current situation facing DACH, as it relates to the region and the WRHCS. The second purpose is to offer several alternative scenarios outlining the best courses of action for the future health care planning of DACH. Final recommendations to senior leaders will be made regarding the best possible options based on an economic analysis, current health care policy and health care facility renovation and replacement trends.

Methods and Procedures

The Army is usually without adequate funding for construction and sustainment of mission essential facilities. However, decision-makers can use economic analysis to assist them while making important decisions regarding prioritization of projects. An economic analysis (EA) is a tool that provides a systematic method for studying and subsequently determining the best choice. The goal of the Army's EA process is to compare quantitative cost and benefit information for several alternative scenarios in order to help make sound and appropriate facility project (DA PAM 415-3, 1992).

Alternative scenario analyses of possible options for the future of DACH will be presented using a combination of economic as well as health care requirement analyses. Both quantitative and qualitative methods will be utilized for this study. Life cycle cost comparisons using net present values and sensitivity analyses will be used to determine which alternative is the most cost-effective for the government.

According to Peter Schwartz, President of Global Business Network, planning for many different futures allows a person or company to develop an array of possibilities and then rehearse a response to each of them (Schwartz, 1991). If an organization can envision several different outcomes for a facility planning issue, then it will be more proactive when the future strategies and plans become reality. This project describes alternative scenarios as defined by the Department of the Army (DA PAM 41 5-3, 1992):

1. Status quo: assumes that the existing facility will continue to be used to meet requirements, including routine maintenance. This scenario usually constitutes the baseline against which all other alternatives are evaluated.

2. New Construction: a single undertaking to produce a complete and usable facility which includes all construction work, land acquisition, overhead costs and procurement and installation of all necessary equipment.
3. Addition/Alteration: involves a change to the facility that adds or alters its overall external dimensions (i.e., addition of a new and larger emergency room) and or a change in functionality (i.e., inpatient mission to an ambulatory care center mission).
4. Contract for Services: may include using private sector facilities or contractors to provide an alternative method of care to the population.
5. Other DoD or military medical facilities: Alternate DoD facilities will be considered as a possible resource for care (i.e., WRMC or NNMC).

The following steps were used in order to evaluate the alternatives using the following process: 1) establish objective; 2) identify alternatives; 3) formulate assumptions; 4) estimate cost and benefits; 5) compare costs and benefits and rank alternatives; 6) perform sensitivity analysis; and 7) report results and recommendations.

Reliability and validity are important indicators of a successful research study. While validity refers to the extent something measures what it is supposed to measure, reliability is focused on the accuracy and precision of the data (Cooper and Schindler, 1998). All economic analysis information were screened for accuracy as well as timeliness. Data was the most current available and obtained from DoD health care data collection systems. In addition, access of reported data was restricted to contractor data analysts and reports contained no names, telephone numbers, addresses or any other identifying features. These safeguards added to the reliability of the data.

ECONPACK 2.0 software program was used to performs cost sensitivity analyses by varying expense items specified by the analyst to see if the Net Present Values (NPVs) of the two alternatives reverse ranking due to the changes. A sensitivity analysis was performed since there was some uncertainties regarding costs, timing, and other input data, and because the result of the comparison steps did not reveal a clearly superior alternative. This type of analysis allows the analyst to engage in a "what if" process to determine how critical the particular assumptions used in the EA are to the EA results. In the sensitivity analysis, selected parameters or assumptions are allowed to vary to determine whether or not a change in costs is likely to lead to a change in ranking of alternatives (DA PAM 41 5-3, 1992).

ECONPACK 2.0 for Windows is a unique economic analysis computer package available to engineers, economists, master planners, accountants, and other personnel throughout the DoD and the Government. It is a comprehensive program incorporating economic analysis calculations, documentation, and reporting capabilities. It is structured so it can be used by non-economists to prepare complete, properly documented economic analyses (EAs) in support of DoD funding requests (DA PAM 41 5-3, 1992).

Results

Step 1. Establish Objective

The objective of the EA is to determine what is the most economical and beneficial solution for Dewitt Army Community Hospital's future healthcare facility requirements.

Step 2. Identify Alternatives

1. Status quo: *This is not a feasible alternative.* In part 2 and 3 of the Regional Uniform Benefit Model report (Appendix A and B, respectively) it was noted that Fort Belvoir is among the busiest of the MTFs in NARMC. The population and clinical staffing report noted that the Dewitt's primary and specialty care provider utilization rates are below the NARMC goals but consistently higher than all other facilities within NARMC. The facility use analysis summary noted that adding or replacing space would improve Dewitt's ability to deliver care to its population. In addition, recommendations in a recent facility infrastructure survey (Appendix C) indicate that: many of the spaces within the facility are incompatible with currently assigned uses; a significant portion of the existing facility that was designed as inpatient facilities is currently being used for outpatient and/or administrative functions; the building configuration is not ideal for outpatient clinic functions; the facility is in need of internal redesign or new construction to create the best possible solution to accommodate clinic functions and improved departmental relationships; and finally the existing building envelope is failing and exposing structural elements to deterioration.

2. New Construction: estimated costs of a new replacement facility at Fort Belvoir are included at Appendixes D. It is highly unlikely that an adequate funding stream of over $100 million will be available in the immediate future for such an endeavor based on recent health facility funding trends. Something must be done soon to eradicate the identified deficiencies. Currently there is a placeholder in FY 04 for approximately $46 million for a potential MILCON project for a new hospital at Dewitt. This option may not be feasible based on inadequate funding in the future.
3. Addition/Alteration: *Currently this is the most feasible option.* As previously noted in Appendix A and B, Fort Belvoir is among the busiest of the MTFs in NARMC and adding appropriate type of space will improve the hospital's ability to deliver quality care to its population. There is currently a placeholder in FY 00 for a Mother-Baby renewal project that involves a major renovation of the third floor labor/delivery and OB/GYN areas.
4. Contract for Services: Although the DoD's managed care program (TRICARE) has recently undergone and onslaught of criticism, it remains the best and cheapest alternative to health care for military beneficiaries. As previously mentioned, currently 70% of health care is provided directly at MTFs and 30% of care is provided by contract network providers. According to Dr. Sue Bailey, the TRICARE program is better than the old military medical care system, better than civilian health plans and less complex (TRICARE, 2000). Currently the newest initiative (from Health Affairs and the TRICARE Management Activity) is to recapture workload within MTFs and decrease the need for contracted care. The

RUBM analysis noted that adequate space and providers are available within the DHCS, however the appropriateness of function space based on the current needs of the system are less than adequate to provide quality care. Recapturing workload and further optimizing the regional healthcare system can be accomplished within the appropriate health care facility.

5. Other DoD or military medical facilities: There are already numerous tri-service resource sharing agreements within the NCR. The feasibility of further integration and /or consolidation of health care service should be studied further.

Step 3. Formulate assumptions

1. Military health care in the NCR will continue to be a priority for DoD senior leaders and will never be contracted out entirely.
2. Health care facility funding resources from DoD will continue to be inadequate to maintain and sustain the current infrastructure.
3. Military health care in the NCR will continue to be provided on a tri-service basis until future leaders can make the tough decisions on how to consolidate the health care provided at three major medical canters in the NCR as recently recommended by the GAO.

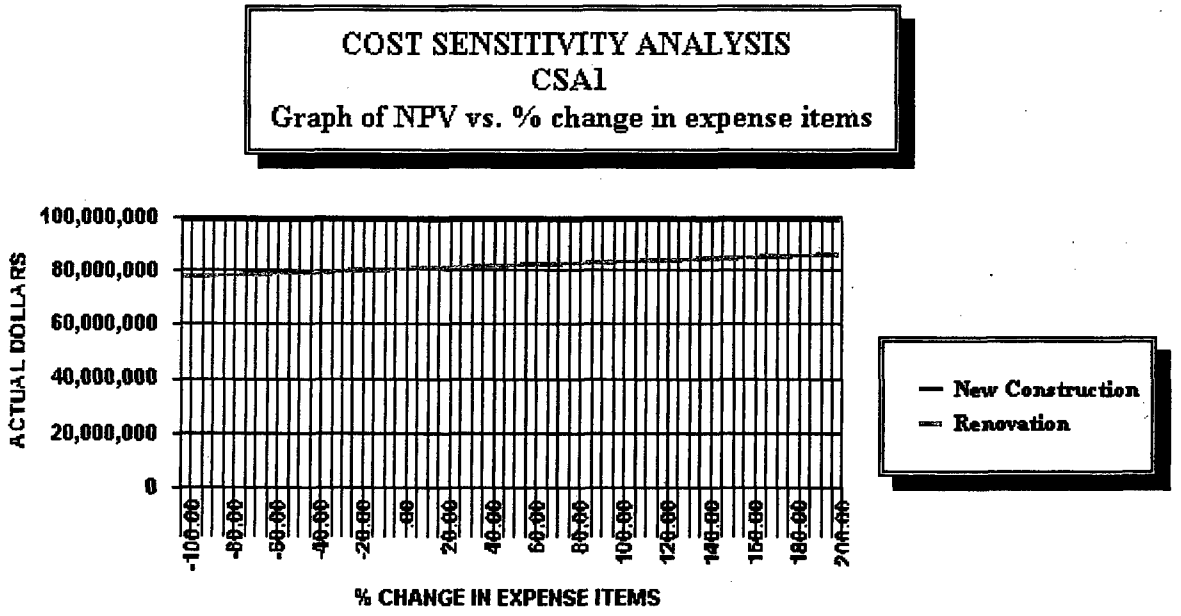
Step 4. Estimate cost (see Appendix D)

Step 5. Compare costs and benefits and rank alternatives (see Appendix E)

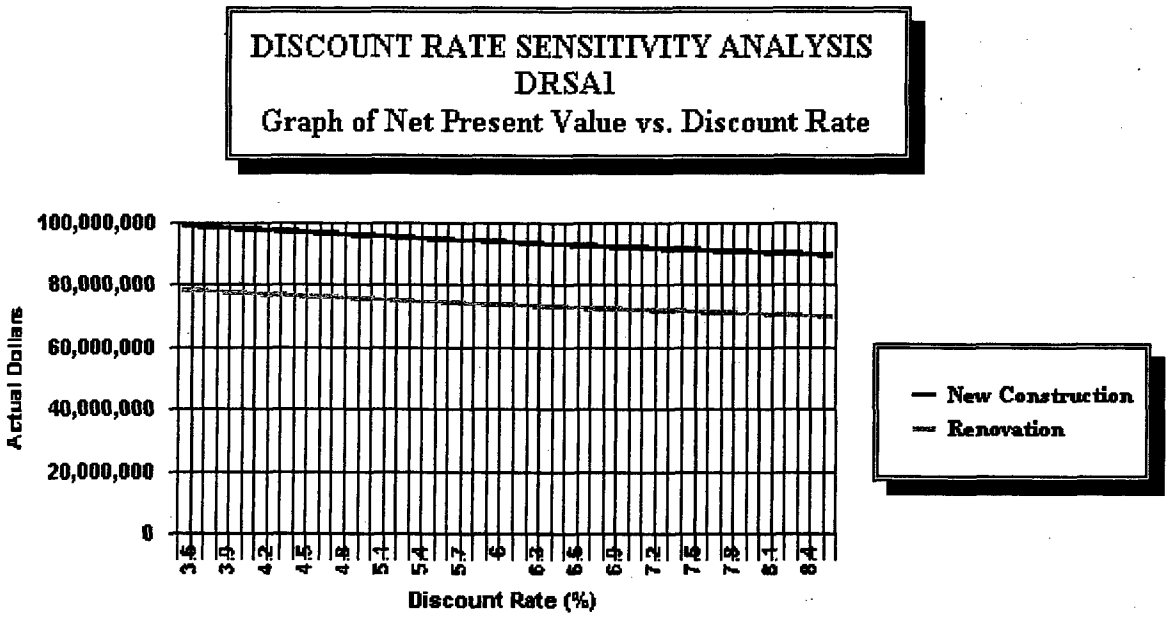
Net Present Value (NPV) is used since both alternatives met the mission requirement over the same period of analysis. The NPV was calculated for each alternative and then ranked. The alternative of alteration/addition had the lowest NPV and is the preferred option. The NPV was calculated for each alternative by discounting the value of the costs minus the benefits for each year and summing over the years for a total or net value.

Step 6. Perform sensitivity analysis

A cost sensitivity analysis was performed to ascertain if a cost sensitivity exists for the stated alternatives. This was accomplished by changing one or more of the variables used in conducting the calculations. The ranking of alternatives was found to be insensitive to changes in selected expense (transition planning). Thus as transition planning costs increase for the renovation, there would be no affect on the rank order of possible alternatives.



In addition, a discount rate analysis demonstrates that higher discount rates minimize the effect of future costs, and initial investment costs have a greater impact on the results of the analysis. Lower discount rates, on the other hand, increase the importance of long-term costs in the analysis. Appendix E provides further details of this analysis.



Step 7. Report results and recommendations

Discussion

The results indicate that an addition/alteration of DACH will be the least expensive and most feasible scenario based on traditional costs breakdown as well as NPV analysis over the long term cost period. However, economic analyses are merely the first step along the long path needed to determine whether or not the least expensive option is really the preferred COA. Further analyses of population-based health care data as well as future health care policy predictions by DoD/Health Affairs senior leaders must also be considered (e.g., current DoD health care policy issues as well as the most current information forthcoming from this year's MHS 2025 working group). It should be noted that the USAHFPA has recently begun a health care analysis assessment at Dewitt. The future success of our healthcare system is dependent not only on future funding streams but also whether or not funding is appropriately timed and sequenced against actual requirements.

According to Chan, Sharma and Tumin in the September 1999 GAO Report on Military Infrastructure, "the adoption of sound standards, measures, and processes will help DoD maximize its RPM (real property maintenance) investment and ensure that needed facilities are adequately maintained, and those that are unneeded are removed from the inventory" (page 24). Senior leaders armed with appropriate information and insights involving alternative scenarios for the future of DACH can better make decisions that will affect the type and quality of care provided by the organization. Most would agree that quality care must be provided at a quality facility. It is imperative that decisions regarding the future of this vital medical facility are made now and not later.

The continual and constant trend of underfunding for military health care construction is again evident in the latest Defense Authorization Bill for FY 2001. Although the President's

fiscal year 2001 military construction budget request is a marked improvement over the fiscal year 2000 budget submission, it continues the trend of severely underfunding military construction accounts that began in fiscal year 1996. The President's $8 billion request for military construction and military family housing programs for fiscal year 2001 was actually $500 million below the levels authorized in the current fiscal year. It was also approximately 25% below the level requested just six years ago. The House Armed Services Committee added over $6.1 billion to the President's budgets over the past five years in an effort to improve military infrastructure (Spence, 2000). However, the targeted additional funding was directed towards critical military infrastructure accounts to improve living and working conditions for military personnel and their families rather than health care infrastructure.

Recommendations

Ensure that the Mother-Baby Renovation project at Dewitt ACH remains high on the MEDCOM funding priority list. Currently there has been a FY 00 O&M approval for a $3.5 million renovation project of the third floor mother-baby unit, in an attempt to incrementally revitalize a 42-year old building. As of March 2000 this project was ranked only 11 out of 20 renewal projects for FY 00. NARMC senior leaders must keep MEDCOM informed of the current justifications and reasons for funding this project. Due to recent MILCON funding shortfalls it is obvious that a priority of 11 may not elevate this project to one that eventually will become a reality.

Ensure that a funding placeholder remains for the potential MILCON appropriation of $46 million dollars currently in the funding stream for a FY 04 project that is to be used for a major addition/alteration project to repair the numerous major structural, mechanical, electrical and functional defects well-documented by site survey master planning teams. It is apparent that care at Dewitt will be compromised if support for a major project is not provided due to inadequate space, failing infrastructure as well as appropriate prioritization of military construction. Although building a new hospital may be the long-term solution to correct the extensive facility deficiencies and space utilization problems, future funding for incremental addition/alteration projects is likely the most realistic and feasible option at this time.

Further integration of health care services in the NCR must become a priority for NARMC and all MTFs within the region. Senior leaders to include the Service's Surgeons Generals and the current leader of Health Affairs agree that immediate integration is an imperative. The Military Health System Strategic plan for 2000 outlined a vision that included an enterprise that provides health support for the Nation's security by using a MHS that

functions as an integrated and accountable health team (Blanck, Koenig, Martin and Roadman, 1999). The idea of closing inpatient or outpatient services at the Army's flagship medical center in the NCR is a foreign concept and unlikely scenario for most senior health care leaders; however, it is essential that future decisions are based on current facts and not on mere emotions.

Finally, and in keeping with the MHS Strategic Plan, it is vital to the survival of our military health care system that senior leaders use cost/benefit analysis to determine when outsourcing and privatization are appropriate alternatives for achieving the MHS mission. The Defense Health Program continues to dwindle while the cost of health care skyrockets. The question should not be should we integrate and consolidate our military systems, but the question should be when.

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APPENDIX A

Report from Application of the Regional Uniform Benefit Model

Population and Clinical Staffing (Part 2)

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May 1999

A. Primary Care Population Analysis

1. Results of the RUBM Analysis

The standard population analysis methodology for the Regional Uniform Benefit Model (RUBM) uses the following equation*:

TRICARE Eligible Users	+	*Medicare LOE*	+	*Unenrollable Population*	+	*5% Buffer Factor*	=	*Primary Care Staffing Population*

Using the CHCS database of actual individual users for the recent 12-month period analyzed as the estimate of enrollees, the staffing population for DeWitt ACH would be as follows:

(88,303 users + 10,534 Medicare LOE) = 98,837 * 1.05 = 103,779

- *Detailed in Methodology section.*

2. Alternative Population Estimates

Alternative methods for evaluating population were considered including the following:

RAPS Eligible: The entire eligible beneficiary population (RAPS estimated 1999) is 125,348.

MTF projected enrollment: Basing the population on the MTF enrollment projection of 83,440 (no added buffer) plus 10,534 Medicare LOE would result in a population of 93,974.

3. Recommendation

Since it is unlikely that all eligibles will enroll, using the higher RAPS eligible population as the population estimate is excessive. The RUBM user analysis gives 100% enrollment credit for all users, and is higher than the projected enrollment. Until MTF enrollment numbers are more clearly defined, the higher staffing population based on actual CHCS users will be used. The calculated RUBM primary care population for determining staffing recommendations as described above is:

98,837 x 1.05 = 103,779

Primary Care Provider Requirement Analysis

1. Results of the RUBM Analysis

Based on a population of 103,779 and the enrollment capacity of 1,476 per FTE, the requirement generated is 70.3 FTE primary care providers. This population would be expected to generate a demand of 415,116 visits at the rate of 4.0 visits per person per year. Approximately 20,756 of these visits would be related to the 5% adjustment (buffer) included in the population analysis.

2. Analysis of Current Situation

Primary care visits for the recent 12-month period evaluated were 330,745 (excluding ER visits). This number includes visits to all primary care sites identified at the MTF. Telephone consults are not included in this total. For productivity comparison, telcons are counted at 1/3 of the total value of actual in-clinic visits. Base FTEs and average productivity in the primary care services are as follows.

The DeWitt Family Health Center (FHC) is organized to include Family Practice, Internal Medicine, and Pediatrics. It provides primary care service to include outpatient procedures. The FHC is also the center of the Family Practice Residency and functions as a TMC. The four areas identified are included in the analysis (visits, providers and FTEs). Resident FTEs and visits are included, but they are not counted as providers for this analysis.

DeWitt Family Health Center

Visits: (70,475)+ 1/3 Telcons (30,770/3 =10,257)	80,732
Available Primary Care FTEs:	20.4
Available Primary Care Providers:	27
Visits per FTE:	*3,957*
Visits per Provider:	*2,990*
Current FTE Capacity (x 5,906):	*120,482*

Woodbridge

Visits: (84,379)+ 1/3 Telcons (22,804/3 =7,601)	91,980
Available Primary Care FTEs:	15.1
Available Primary Care Providers:	16.6
Visits per FTE:	*6,091*
Visits per Provider:	*5,541*
Current FTE Capacity (x 5,906):	*89,181*

Rader Clinic

Visits: (53,037)+ 1/3 Telcons (10,798/3 =3,599)	56,636
Available Primary Care FTEs:	13.9
Available Primary Care Providers:	19
Visits per FTE:	*4,075*
Visits per Provider:	*2,980*
Current FTE Capacity (x 5,906):	*82,093*

Fairfax

Visits: (72,668)+ 1/3 Telcons (20,219/3 =6,740)	79,408
Available Primary Care FTEs:	19.8
Available Primary Care Providers:	20.3
Visits per FTE:	*4,011*
Visits per Provider:	*3,911*
Current FTE Capacity (x 5,906):	*116,939*

Productivity analysis of the entire DeWitt primary care system includes all above sites plus visits and providers from aviation medicine, ECC, women's wellness, physical exams, and well baby clinics, but excludes the emergency room.

DeWitt Primary Care System

Visits: (330,745)+ 1/3 Telcons (86,889/3 =28,963)	359,708
Available Primary Care FTEs:	79.0
Available Primary Care Providers:	95.4
Visits per FTE:	*4,553*
Visits per Provider:	*3,771*
Current FTE Capacity (x 5,906):	*466,574*

Productivity of primary care providers for the DeWitt Primary Care system is 22.9% below the RUBM planning factor of 5,906 visits per FTE provider (DeWitt FHC is 33.0% below, Woodbridge 3.1% above, Fairfax 32.1% below, and Rader 31.0% below).

3. Recommendation

Based on a primary care population of 103,779 and a panel size of 1,476 patients, 70.3 FTE Primary Care Providers would be required, generating a capacity for 415,256 visits. Currently, 79.0 provider FTEs[1] are available.

The provider staffing recommendation based upon this analysis, taking into account current staffing, provider availability and regional constraints, is as follows:

- 27 Family Practitioners (14 AD, 3 Civilian, 10 Contract)
- 9 General Medical Officers (6 AD, 3 Civilian)
- 15 Nurse Practitioners (2 AD, 1 Civilian, 11.4 Contract)
- 4 Physician Assistants (Contract)
- 15 Pediatricians (GS) (3 AD, 4 Civilian, 8 Contract)
- 14 Internists (GS) (2 AD, 9 Civilian, 3 Contract)
- 2 Flight Surgeons (AD)
- 1 Nurse Midwife (AD)

This is a total of 87 providers, with an availability of 71.3 FTEs (DeWitt has 36 Providers and 25.8 FTEs, Rader 15 providers with 13.2 FTEs, Woodbridge has 14 providers with 13.1 FTEs, and Fairfax has 22 providers and 19.2 FTEs).

[1] DeWitt FHC: 20.4, Fairfax: 19.8, Rader: 13.9, Woodbridge: 15.1, Women's Wellness: 2.4, Physical Exams: 0.9, Flight Medicine: 1.0, and 5.5 FTEs in the ECC/AMIC.

Primary Care Support Staff Requirements

1. RUBM Support Staff Methodology: The standard staffing support ratios for RUBM per 1.0 provider is:

   - 1.0 medical assistant,
   - 0.33 RN, and
   - 0.5 clerical staff.

   In addition, unique MTF demands have been cited and included where appropriate.

2. DeWitt ACH Primary Care Clinic Analysis: Based on the standard support staffing methodology for the DeWitt Army Community Hospital's 87 providers, the following support staff is required.

   For the 36 providers at DeWitt, 36 medical assistants, 12 RNs, and 18 clerical staff are required. Add medical assistants as NCOICs for Women's Wellness, physical exam and flight medicine, and the Family Health Center (3 total), plus a departmental NCOIC. Also add a secretary for the department chief and program director (2 total).

   40 Medical Assistants
   12 RNs
   20 Clerical Staff
   72 Total

   For the 15 providers at Rader Clinic, 15 medical assistants, 5 RNs, and 8 clerical staff, plus an NCOIC and a clinic secretary are required.

   16 Medical Assistants
   5 RNs
   9 Clerical Staff
   30 Total

   For the 22 providers at Fairfax, 22 medical assistants, 8RNs, and 11 clerical staff, plus an NCOIC and a clinic secretary are required.

   23 Medical Assistants
   8 RNs
   12 Clerical Staff
   43 Total

For the 14 providers at Woodbridge, 14 medical assistants, 5 RNs, and 7 clerical staff, plus an NCOIC and a clinic secretary are required.

15 Medical Assistants
5 RNs
8 Clerical Staff
28 Total

Since adequate staffing is available in the primary care system to see all patient visits, the ER usage should markedly decrease and be required to handle true urgent and emergent care only. Physician staffing should be with ER physicians. For one physician, coverage 24 hours per day requires 6 physicians, including the chief as part-time (2 AD, 4.25 contract). Support staffing of 1 RN and 2 medical assistants per shift requires 6 RNs and 11 medical assistants, plus an NCOIC and head nurse. The EMT and paramedic staff can augment these personnel if needed. Maintain EMT staff at 5 91B EMT and paramedic staff at 10.

System-wide support staff totals recommended are:

121 Medical Assistants
37 RNs
49 Clerical Staff
207 Total Support Staff

Specialty Care Provider Requirements

1. Results of the RUBM Population Analysis

The standard population analysis methodology for the Regional Uniform Benefit Model (RUBM) determines an MTF's specialty care population by using the base primary care population calculated and applying a larger buffer factor for specialty care, resulting in the following equation for determining the specialty care population:

$$\textit{Enrollees} + \textit{Medicare} + \textit{Unenrollable Population} + \textit{15\% Specialty Care Buffer} = \textit{Population}$$

Using the CHCS database of actual individual users for the recent 12-month period analyzed as the estimate of enrollees, the specialty care population for DeWitt ACH using this standard approach would be as follows:

$$(88{,}303 + 10{,}534) * 1.15 = \mathbf{113{,}663}$$

2. Alternative Estimates of Specialists Required and Recommendation

Based upon the size of the RUBM specialty care population determined above, the estimated numbers of specialty care providers were calculated based upon the RUBM's recommended physician to population ratios. In addition to estimating the number of providers required, the RUBM also calculates the number of providers who would be required to manage the current clinic visit workload for each specialty.

In summary, the number of specialty care providers needed to support the demand at DeWitt ACH, based upon these two alternative RUBM approaches for determining provider requirements, is illustrated in the following table. The actual RUBM specialty care provider staffing recommendations are presented in the third column of the table. It should be noted that the number of specialty care providers recommended is based upon a number of additional factors (see *Part 1, section II.B.*).

	Provider need based on population	Provider need based on current volumes	RUBM Providers Recommended
Allergy	1.6	3.8	1
Cardiology	2.5	0.5	1
Dermatology	3.0	1.4	1
Gastroenterology	2.1	1.0	2
General Surgery	7.8	2.9	3
Ophthalmology	3.9	1.2	1
Optometry	12.7	1.5	2
Orthopedic Surgery	7.7	3.2	6
Otolaryngology	3.9	NA	1
Podiatry	4.2	1.6	2
Pulmonary	2.5	NA	0
Urology	2.9	1.8	2

Due to the number of specialists at Walter Reed Army Medical Center, current referral patterns and circuit riding potential from WRAMC, not all specialties are fully staffed to the level of population needs.

Although an allergist is still recommended, a military fill is unlikely. Cardiology is to be filled in year 2000 with circuit riding support from WRAMC until then. A clear increase in optometrists is required, especially in light of TRICARE benefits. Recommend pursuing resource sharing/ personal services contract/ network options. Currently the Dewitt facility is inadequate to handle more optometrists or ophthalmologists with only 2 eye lanes.

A large orthopedic service is apparently required due to some reliance of Quantico on the Dewitt system for care. Visit volumes, however, do not support this and need to be reviewed. Recommend maintaining current provider strength until visit productivity and Quantico support are reviewed.

Obstetricians are distributed based upon deliveries per month, with approximately 15 per obstetrician and 7-10 for nurse midwives and family practitioners. The five obstetricians, two midwives, family practice staff and Department Chief (60J) should cover the approximately 95 deliveries per month.

Staffing at Rader Clinic is to be maintained at one optometrist and one podiatrist.

Specialty Care Support Staff Requirements

1. RUBM Support Staff Methodology: The standard staffing support ratios for RUBM per 1.0 provider is:

Type of provider	RNs	LPN/Tech/Medic	Clerical
Primary care and clinic-based specialties	**0.33**	**1.00**	**0.50**
Procedure-based specialties	**0.20**	**1.00**	**0.50**
• Obstetrics/Gynecology	**0.33**	**1.00**	**0.50**
• Ophthalmology/Optometry	**0.00**	**2.00**	**0.50**

2. Some variation in this standard occurs depending on specialty type. Where appropriate, specialty care technicians are matched to their specialists (e.g., 91BP1 orthopedic tech to orthopedic surgeon or podiatrist). Staffing also varies depending on time spent by specialists in clinic versus that spent in the operating room or on other procedures (endoscopy, cardiac cath, etc.). General planning is a 1/3 decrease in the provider numbers to adjust for non-clinic time. For example, for 7 orthopedic providers, 7 * 0.67 = 4.67 net clinic staff, so 5 medical assistants are recommended.

3. Recommendation:

Based on the standard support staffing methodology for the DeWitt Army Community Hospital's providers, the following support staff is required:

Orthopedics/Podiatry

For 7 providers - 5 cast technicians plus 1 NCOIC, 3 clerical support and 1 RN.

General Surgery/Urology

For 5 providers - 3 medical assistants plus 1 for minor procedures and 1 for urologic procedures, 2 clerical support and 1 RN.

Optometry/Ophthalmology

For 2 providers with 2 eye lanes - 3 eye technicians and 1 clerical support.

ENT/Audiology

For 3 providers – 3 ENT technicians and 2 clerical support.

OB/Gyn

For 7 providers - 5 medical assistants plus 1 NCOIC and 1 medical assistant for procedures, 2 RNs, and 4 clerical support.

Medicine Subspecialty (Derm, GI, Cardiology, Neurology, Allergy, etc.)

For 6 providers plus circuit riders from WRAMC - 6 medical assistants plus 1 for NCOIC, 2 for procedures (EKG's scopes, etc.), and 2 for allergy testing/immunizations. Two RN's and 3 clerical support.

Also have secretary for the Department of Surgery and Department of Medicine.

Maintain 91V staff at 5.

Staffing support for the Rader Clinic Optometrist and Podiatrist is 2 eye techs, 1 ortho tech, and 1 clerical person.

Specialty Care Support Totals:

43	Medical Assistants
6	RNs
18	Clerical Staff
67	**Total Support Staff**

Inpatient Provider Requirements

1. Medical-Surgical Unit – Based on an ADC (average daily census) of 12, which includes observation patients, and average acuity category 3, total required nursing care hours per day are 127. In addition, a RN from the unit covers the IV Clinic, which uses a room on this unit. This would require the following staff, including Head Nurse and Wardmaster.

   13 Registered Nurses
   9 Licensed Practical Nurses
   8 Medical Assistants
   1 Clerical

   Observation patients are included in the admission and patient days count at this MTF. Short-staffing in other departments impacts this inpatient unit.

2. Intensive Care Unit – Based on an ADC of 4 and average acuity category 4, total required nursing care hours per day are 66. This would require the following staff for the unit, including the Head Nurse and Wardmaster.

   11 Registered Nurses
   6 Licensed Practical Nurses
   1 Clerical

   There is currently no secretarial support. There are frequent transfers in and out of unit and the unit manages post-operative patients after 4:30 PM, when the PACU is closed (20-40 patients/month).

3. Surgical Services

   a. Operating Room - Based on 3 OR's, an average of 10 procedures per day, hours of operation, and on-call requirements, the following staff is required including a Head Nurse and NCOIC who cover the SDS/PAT/PACU as well.

      6 Registered Nurses
      1 NCOIC
      6 OR Technicians
      1 Supply Tech
      1 Clerical

   b. SDS/PACU/Phase II Unit - Based on an average of 10 procedures per day, hours of operation, and on-call requirements, the following staff is required.

      7 Registered Nurses
      4 Licensed Practical Nurses
      1 Medical Assistants
      1 Clerical

   The above staffing includes one RN and 2 Technicians on-call. The SDS/PAT staff also cover the endoscopy room. There are 5 OR's available, but one room has significant mechanical problems and is used for storage. The current 3 OR's are sufficient for current volume. The PACU has 4 Phase I beds and 5 Phase II recliners. There are 3 holding beds for pre-op patients.

4. Obstetrical Services

a. Labor and Delivery - Based on the average number of deliveries per day of 3, and antenatal testing, the following staff is required, including Head Nurse and Wardmaster who will cover the Mother/Baby unit as well.

11 Registered Nurses
6 Licensed Practical Nurses
1 Clerical

b. Mother/Baby Unit - Based on an average daily census of 14 (7 mother/baby couples), the following staff is required.

10 Registered Nurses
5 Licensed Practical Nurses
2 91B
1 Clerk

L&D includes a Antenatal Diagnostic Center which operates 4 mornings/week and sees approximately 250 visits/month. They average 310 non-admission patients per month. Emergency c-sections are done in L&D, scheduled cases in the OR. All patients are recovered in PACU or ICU. Deliveries are 80-100 per month. The Mother/Baby Unit has rooming-in, although a Nursery is available.

Ancillary Provider Requirements

1. Pathology and Laboratory

In keeping with the Reference Laboratory Concept, described in detail in the methodology section (*Part 1- Section III.D.1*), DeWitt ACH should have the Laboratory menu identified in *Exhibit C* of ***Part 1*** as appropriate to an Inpatient Meddac site. The required staffing to support this initiative is as follows.

2	Pathologists
16	71E and Medical Technologists
15	91K and Medical Technicians
3	Clerical Support Personnel

A detailed description of the Laboratory staffing can be found in ***Part 4***. As mentioned in the ***Part 1*** methodology section, MTF-CHCS interconnectivity, courier systems, and processing personnel all must be in place to allow this reference laboratory initiative to be successful. As these issues are resolved, excess equipment turn-in and personnel changes can occur (anticipated over the next 1-2 years).

2. Pharmacy

Pharmacy services were separated for each of the four facilities in the DeWitt health care system. Based on the guidelines established in the methodology section (***Part 1*** - *Section III.D.2*), the recommended staffing for these clinics is:

Fairfax Clinic, as a Prime (-) site with 531 prescriptions/day (132,815/250):

3	Pharmacists
4	Pharmacy Technicians
0	Clerical

Woodbridge Clinic, as a Prime (-) site with 683 prescriptions/day (170,693/250):

4	Pharmacists
5	Pharmacy Technicians
0	Clerical

Rader Clinic, as a Prime site with 922 prescriptions/day (230,661/250):

6	Pharmacists
10	Pharmacy Technicians
1	Clerical

Plus 1 Pharm D.

DeWitt ACH, as an inpatient MEDDAC site with 1,599 prescriptions/day (399,671/250):

10	Pharmacists
20	Pharmacy Technicians
1	Clerical

Plus 4 Pharm D.

System-wide totals:

28	Pharmacists
39	Pharmacy Technicians
2	Clerical

3. Radiology

The radiology services and volumes of procedures provided annually at DeWitt ACH and the technician staffing required to support these volumes are as follows:

Service	Volume*	Rate/Tech/Yr	# of Techs Required
Plain film	43,602	6,750	6.46
Fluoroscopy	966	2,250	0.43
Mammography	12,000	3,600	3.33
Ultrasound	1,947	1,800	1.08
CT Scans	4,035	2,700	1.49
Total Weighted Procedures	**114,361**	**NA**	

**Volumes include all sites.*

In conjunction with general planning guidelines – *Exhibit D*, the following staffing is recommended:

6	Radiologists
25	Technicians
6	Clerical

Radiology services are summarized for all four clinic sites. Total weighted procedures (114,361) requires 6 (5.7) radiologists. Technician support for Plain Film and Fluoroscopy requires 6.89 techs, adjusted to 9 for lost time, plus 2 for call. Likewise, CT and Ultrasound require 2 technicians plus 1 each for call, and mammography requires 4 technicians. An additional departmental NCOIC, an NCO for the radiology/fluoroscopy section, and 2 supply techs are required. Six clerical for support of records, appointing, and secretarial for the 6 radiologists.

Appendix B

Report from Application of the Regional Uniform Benefit Model

Facility Use Analysis (Part 3)

Prepared by
The Bristol Group, Inc.
Boston, MA
May 1999

Methodology for the RUBM Schedule and Space Use Efficiency Analysis

The general trend for MTFs (NARMC and other Army regions) has been the shrinking of healthcare delivery resources. This has meant a reduction (sometimes dramatic) in the mission of many MTFs. A reduced healthcare service delivery mission often occurs in facilities where the original amount of space (and sometimes staff) is still in operation. It is common to see such "loose fits" of reduced medical missions in oversized facilities.

The goal of the Regional Benefit Model is the rational allocation of manpower and capital resources among the various NARMC MTF sites. The facility analysis portion of RUBM is intended to identify the way in which existing facility resources are being used and to provide a general analysis of what space will be needed in the future.

The facility efficiency analysis is being used as an index to identify the efficiency and demand of staff, schedule and space resources. This efficiency analysis is intended to enlighten the allocation of manpower and capital resources. The space use analysis goal is to identify opportunities such as:

- Regionalization of healthcare resources.
- Consolidation of facilities and/or operations.
- Improved operations and patient care delivery.
- Capital project avoidance.

Methodology for the RUBM: Schedule and Space Use Efficiency Analyses
The efficiency analyses of existing space are not intended to be a measurement of how hard the physicians and other caregivers work. They indicate the extent to which available schedule time and space is actually used (or unused). Increasing utilization can be accomplished simply by:

- Leveling the schedule and space use by ramping up to an increased use over time (or)
- Reducing (or consolidating with other users) the amount of space and schedule time in use.

The Utilization Analysis is a study of the existing supply of space, and how efficiently each department uses the scheduled time. The following analysis evaluates how well ambulatory and diagnostic/treatment services are using existing space and how it compares to other "peer" providers and healthcare planning standards. The method used to evaluate space use efficiency relies on two approaches:

1) % Use: Comparing the use of space and schedule to the capacity to provide service

$$\% \text{ Use} = \frac{\text{In-Room Time x Total Visits}}{\text{Time Available}}$$

2) Benchmarking: Comparisons to other providers, especially to other Army MTF's and civilian providers using a military overlay.

The Utilization Analysis evaluates how well existing space is being used, and identifies excess capacity and the existing space supply needed for growth. The following analysis supplements the Schedule and Space Use Analysis presented separately for the overall NARMC system.
It is important to understand that low % utilization (whether in comparison to benchmark standards, from one department to the next, or from one MTF to another) can be caused by a number of factors. Some departments or MTFs may have increased or extended hours of operation which increases the denominator in the % Use equation when compared to a department or MTF with shorter hours. Some services may have more exam room capacity than providers and some may be short support personnel which might slow room turnover times compared to expected standard in-room times.

The Value of Space Use Efficiency Data in Future Facility Planning

Understanding the extent to which current clinical facilities are being efficiently utilized today can help the MTFs to effect the right mix of physical and operational improvements to increase efficiency and productivity. It will require each MTF to adopt the facility guidelines regarding available clinic hours and utilization targets proposed in the RUBM as summarized in the % Utilization Benchmarks that are provided as part of the Space/Schedule Utilization Analysis performed for each MTF.

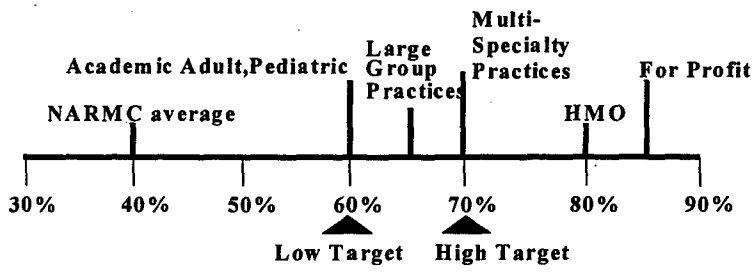
Maintaining relatively high % utilization is a balance between patient access and the efficient use of schedule, staff and space. Low % utilization is an indicator that excess patient care capacity exists within the current scheduled hours and space that is available to the service. Before making any decision to increase the facilities, each MTF needs to explore operational initiatives, which might free up this "unused" capacity and/or share and consolidate schedule and space.

Ambulatory Services at Fort Belvoir

While the exam rooms available is generally a known figure, the patient in-room time is sometimes estimated (using The Bristol Group's benchmark data) for each program. Following are the expected % utilization for a variety of ambulatory provider types compared to NARMC average of MTFs studied to-date:

The utilization figures reported in the analysis have been generated out of a careful on-site review of hours of CHCS data, visit volumes, hours of operation, number of care spaces and visit lengths that have been reviewed by each department.

Ambulatory % Utilization:Space and Schedule

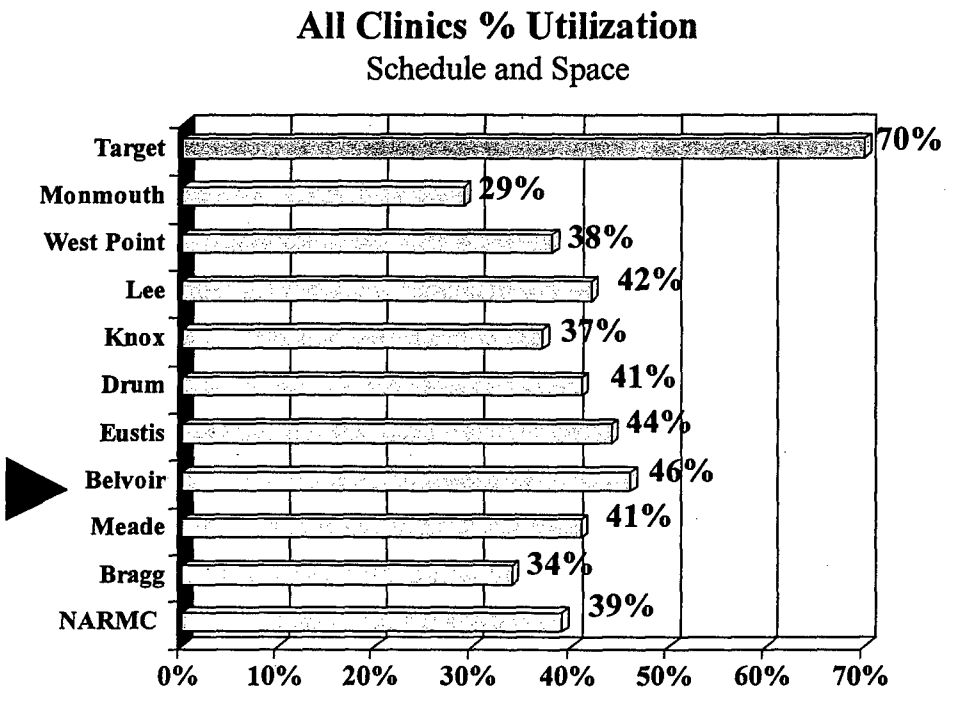


Within each provider type, utilization varies by specialty. Primary Care practices have higher space/schedule utilization rates.

Source: The Bristol Group

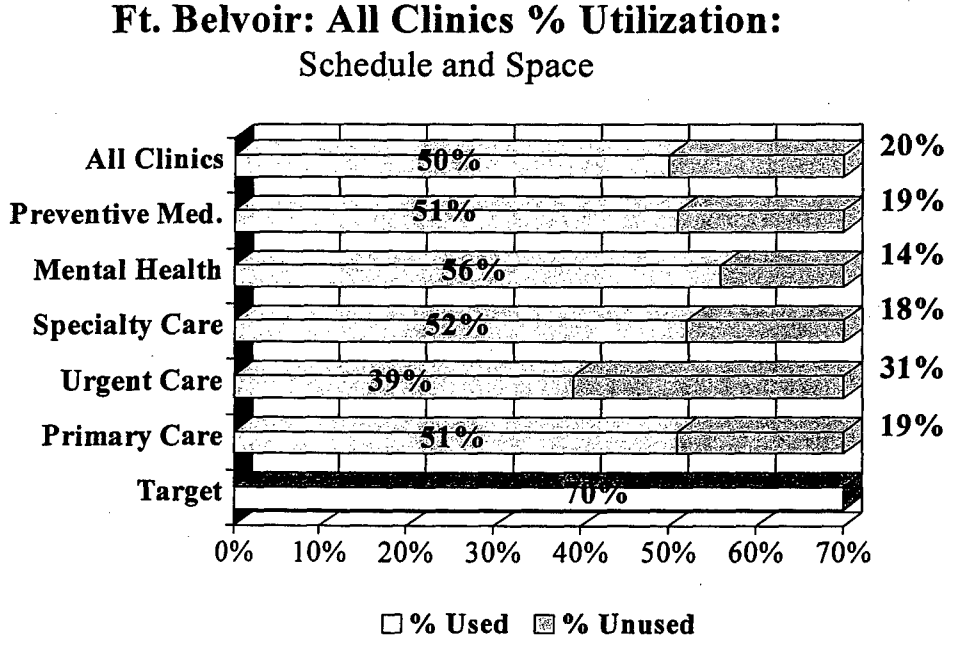
Ambulatory Services at Ft. Belvoir

Ft. Belvoir space and schedule utilization is higher than the 39% NARMC average, but lower than the target benchmark of 70%. This goal is consistent with ambulatory benchmarks summarized above. Ft. Belvoir clinics have 24% unused capacity:



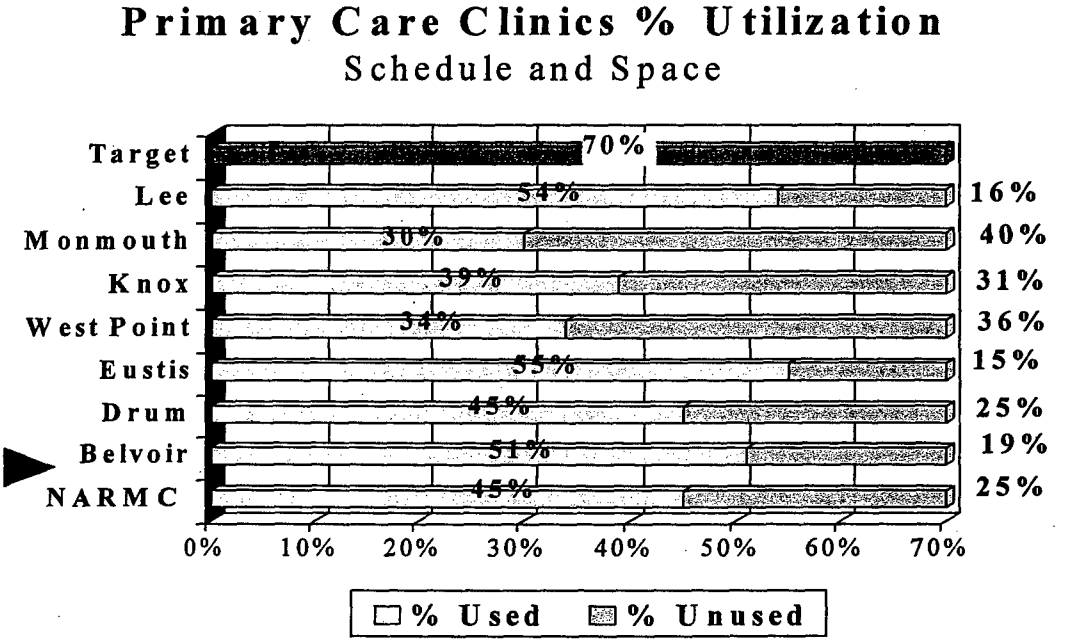
Ft. Belvoir Outpatient Clinics

All Ft. Belvoir clinics have unused space and schedule, based on a target utilization of 70%. Average Primary Care utilization is at 51%; it's 52% in Specialty Care. The utilization in individual clinics varies from a high of 56% for Mental Health to a low of 39% in Urgent Care. Preventive Medicine is at 51% use.



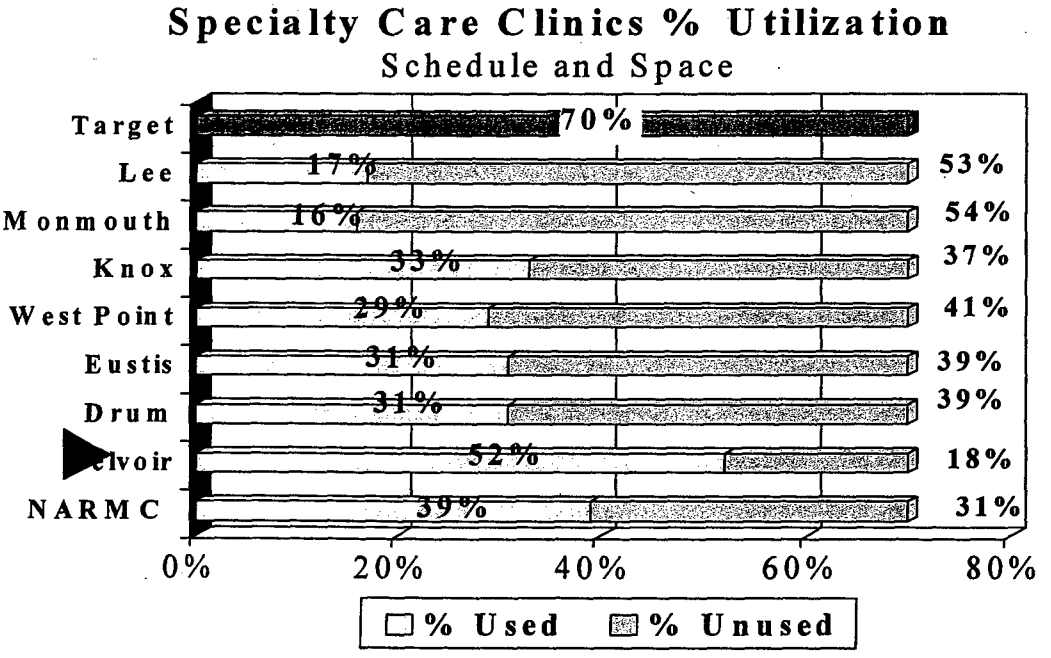
Primary Care Clinics

Ft. Belvoir Primary Care utilization is at 51%. Primary Care utilization varies: 51% at Rader, 69% at Fairfax, 46% at DeWitt Primary Care, 47% at Woodbridge, and 49% at A.P. Hill. There is still 19% unused capacity in Primary Care.



Specialty Care Clinics

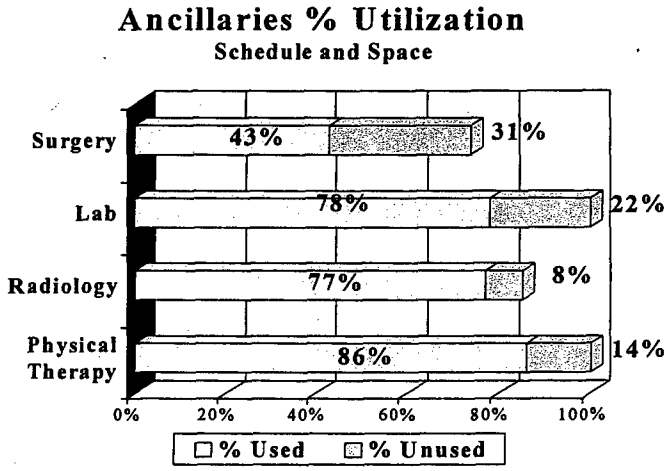
Similarly, Specialty Care (52%) is above the 39% NARMC average. Utilization varies by specialty. No other MTFs are realizing higher schedule and space utilization. There is still 18% unused capacity in Specialty Care at Ft. Belvoir.



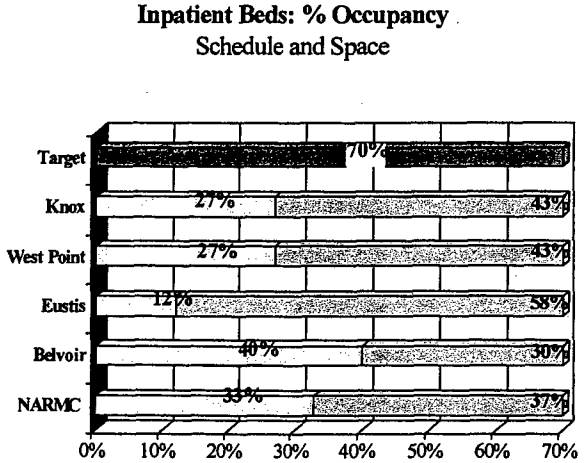
Diagnostic and Treatment Services

Utilization of Diagnostic and Treatment Services at Ft. Belvoir varies:

- Physical Therapy (86%) is near the NARMC average of 82%. PT is at or near capacity.
- Radiology (77%) is near the target 85%, but well above the NARMC average of 62%. The (77%) for radiology is an average of Radiographic/Fluoro (108%), Mammography (33%), Ultrasound (71%) and (32% for) CT.
- Laboratory (78%) is above the average 60% NARMC utilization.
- Surgery (43%) also is near the average NARMC utilization (47%) unused capacity. A large number of outpatient procedures that are routinely done in the ORs at other MTFs are appropriately done in the outpatient setting at Belvoir.



Ft. Belvoir's inpatient occupancy, at 40%, is above the average 34% NARMC utilization, but below the desired goal of 70% occupancy. Note that observation and border patient days are not counted as patient days in estimating % occupancy at any other MTF.



Data Collection and Analysis Assumptions at Ft. Belvoir

The data that is the basis for the Schedule and Space Use Efficiency Analysis was collected, site-verified and reviewed with each department at each MTF. The utilization assumptions in this analysis have been generated out of a review of CHCS visit volumes for a recent 12-month period of operations, the number of care spaces available, and visit lengths that have been corroborated or supplemented by each department.

The *Space and Schedule Utilization Summary* in *Part 4* is a detailed analyses of the % utilization based on the latest workload data. These % utilization analyses in the above narrative was prepared in advance of final workload data being available and the narrative may quote %'s utilization that may be slightly for the data in the *Space and Schedule Utilization Summary*. Differences in identifying workload occur for the following reasons:

- The definition of primary care and specialty care has changed and evolved over time. Assignment of visits in the above report has changed slightly.
- For purposes of measuring space, telephone consults have been excluded since they don't generate a need for patient care spaces.
- In the above analysis, patient visits are aggregated according to where the visits occur, rather than what specialty the visits belong to.
- In some cases, select sites and their associated workloads are not included in the space analysis, especially where staff are provided to non-Army clinics.

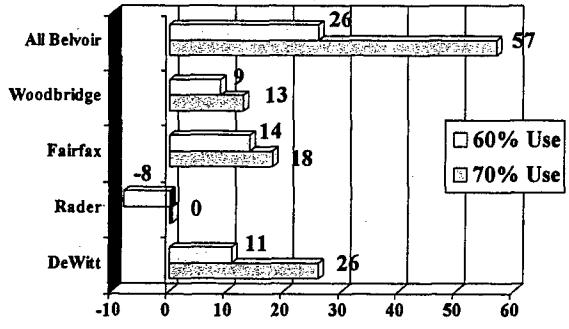
Summary Recommendations

Fort Belvoir is among the busiest of the MTFs in NARMC, especially those MTFs that are part of the Walter Reed Healthcare System. Added or replacement space will improve Belvoir's ability to deliver care to its population. The following are summary observations and recommendations in the use of space at Fort Belvoir:

1. Available Capacity: Until added space is available, Fort Belvoir can add workload and/or a consolidation of specialties where practical. For example, a 60% to 70% use rate for schedule and space for all clinics reveals an available capacity of between 26 and 57 patient care spaces (exam rooms and/or treatment procedure rooms) to absorb added workload. Rader is either at capacity or has a space shortage. Fairfax, Woodbridge and DeWitt have some available capacity. The following chart translates excess capacity into the number of available spaces:
2. Combined Office/Exam Rooms: The shared use of patient care rooms for both exam and office use reduces their capacity for use for either function. Contributing to this inefficiency are:

Unused Clinic Capacity

Patient Care Spaces



Available Patient Care Spaces

- Territoriality of location freezing rooms out of use
- Exam/office rooms taken out of service by occupants who are in clinic but not seeing patients
- Shared office and exam use reduces room availability by 20% - 33%.

In the case of DeWitt, the primary care exam/office rooms should be used and equipped as exam rooms only or offices only and not exam/office shared use. This should offer a larger pool of clinical space that will be needed to serve the expected population and outpatient visit demand.

3. Overuse at Rader: Based on existing population and workload, Rader is at or overused capacity. At a 60% utilization benchmark, Rader it is at or near capacity. At 70% use it has an 8 exam/procedure room deficit (mostly in primary care). It may be possible to reassign spaces from specialty to primary care use to ease the greater primary care demand.

4. Next Steps. Appropriate follow-up studies to Regional Uniform Benefits Model would be:
   - Reallocation Plan: To move demand where excess capacity exists and control the staffing of the new clinical space.
   - Master Facility Plan: Based on the existing % use of existing space, assess the demand for added and /or replacement space and schedule at the Dewitt and Rader facilities.

Appendix C

Facility Survey

Dewitt Army Community Hospital, Building 808
Fort Belvoir, VA,
April 25, 1998 (Revised October 1, 1998)
by
Ed Phillips
Craig Thompson
(VW International, Inc.)
and
Craig Carr
Lawrence Rafshoon
(Leo A. Daly)

General

A field survey was conducted on Monday, April 20, and Tuesday, April 21, 1998. The objective of the survey was to visually observe the current conditions and assess the general condition of the mechanical, electrical, communications and fire alarm systems. Our initial meeting was with the facility manager, Howard Simpson, who made arrangements for the team to have full access to the facility.

The following comments and recommendations are based on observations made during the survey, as well as deficiencies and conditions reported from previous studies and assessments.

Existing Conditions

Many of the spaces within the facility are incompatible with currently assigned uses. A significant portion of the existing facility that was designed as inpatient facilities is currently being used for outpatient and/or administrative functions. The building configuration is not ideal for outpatient clinic functions. The facility is in need of internal redesign or new construction to create the best possible solution to accommodate clinic functions and improved departmental relationships. In addition, the existing building envelope is failing and exposing structural elements to deterioration.

Major Deficiencies

Deficiencies outlined within this section are limited to Building 808. Only deficiencies identified by visual inspection of the building, building systems, and available drawings are considered. Neither destructive testing of building components nor functional testing of building systems are included.

Safety Violations

Some of the existing safety violations at the facility include the presence of asbestos tile and insulation as well as dead-end elevator lobbies on the second through fifth floors. A dead-end corridor exists within the operating room suite. The exterior stairs are not covered to prevent the build up of ice or water during inclement weather.

Handicap Barriers

There are several problems at the facility with handicap accessibility. The doors at the covered entry are ADA compliant but the doors at the main entrance are not. Signage indicates accessible entries. The majority of the toilet rooms in the building, both public and inpatient, are not ADA accessible, and much of the door hardware is not ADA accessible. Water coolers and public telephones are typically not accessible. Not all reception counters are accessible.

- Replace the existing building expansion joints and reseal all construction joints.
- Scuppers need to be added to all parapet walls for storm water relief if roof drains are clogged. Additional roof drains should be considered as over-flow drains.
- Metal coping caps should be added over the precast parapet walls.
- Many existing metal plugs and fasteners in the walls are rusting and need to be removed and the walls patched to match the existing.
- Roof access ladders are rusted and needed to be scraped, primed and painted with a rust-inhibiting type paint.
- Rain leaders need to be cleaned to ensure roof drainage.
- Consider providing alternate life safety devices in the elevator lobbies. Dead end lobbies seem to exist on floors 2 through 5. The dead end distance is greater than 30 feet. Additional safeguards or another means of egress need to be addressed.
- Handicapped toilets need to be provided on all floors.
- Handicapped accessible toilet facilities are required in patient rooms. Depending on the proposed master plan, remaining patient rooms will need to be accessible.
- Water coolers or drinking fountains need to be handicapped accessible.
- Public telephones must have at least one accessible to the handicapped.
- New graphics and signage should be considered. Current signage does not meet minimal requirements.
- Existing windows are single pane glass and badly deteriorated. Units need to be replaced with weather tight, insulating type windows. Consider low "E" type.

  4' 0" x 6' 10"649 units
  4' 0" x 3' 0" 44 units
  4' 0" x 10' 0" 5 units
  3' 2" x 8' 10" 3 units

- Storm windows are falling apart and should be removed. An analysis should determine if storm windows are applicable over the proposed new windows.
- Existing precast windowsills (approximately 2800 lineal feet) are cracked with exposed and rusting reinforcing bars. Broken units should be repaired and/or replaced.
- The existing storefront is single pane glass and is rusting. Some existing sills are flat and collect water.
- The existing concrete structure is spalled with exposed, rusting reinforcing bars. All damaged areas need to be repaired.
- The existing roof needs to be replaced, including all flashing and counter flashing.
- The laboratory area is very cramped and utilization of the space is poor. Use of the available space can be greatly enhanced if non-essential functions are moved out to adjacent areas. The HVAC design is poor and proper ventilation is needed throughout the lab area. Power also needs to be increased to the lab.

- Air handling unit AHU-1 is located in basement mechanical room 4 and serves basement general areas as well as the computer room and adjacent areas. This unit appears to be deficient in cooling capacity. Computer room type CAC units could be considered and placed on emergency power.
- Air handling unit AHU-2 is located in basement mechanical room 2 and serves the basement C-wing.
- Air handling unit AHU-3 is located in basement mechanical room 8 and serves basement E-wing.
- Air handling unit AHU-4 is located in basement mechanical room 8 and serves basement conference room E-11.
- Air handling unit AHU-5 is located in first floor mechanical room C-123 and serves the CAT Scan area on the first floor C-wing.
- Air handling units 6 and 7 serve the emergency room. Both are located in first floor mechanical room 11
- Air handling unit AHU-8 is located in basement mechanical room 8 and serves basement E-wing.
- Air handling unit AHU-9 serves the laboratory/pathology areas and is located in first floor mechanical room 12. The unit appears to be greatly oversized for the application, perhaps due to the large amount of fresh air being introduced. Fresh air enters through a window with a bag filter attached and the room is used as a mixing plenum.
- Air handling unit AHU-10 is located in the newer mechanical room 15, serves the surgical suite and recovery and is in good condition. The unit is served by three air-cooled chillers located on the roof.
- Air handling unit AHU-11 is located in the second floor mechanical room 15, serves the third floor labor/delivery suite and is in good condition. The unit is served by three air-cooled chillers located on the roof.
- Air handling unit AHU-12 is located in the second floor mechanical room 15 and serves the kitchen.
- Air handling unit AHU-13 is located in second floor mechanical room 14, serves the intensive care ward, second floor B-wing. The unit has return air and outside air capability but the quantities are not controlled. The room is utilized as a mixing plenum with outside air introduced through a louver installed in a window opening. The unit is in poor condition and should be replaced.
- Air handling unit AHU-14 is located in third floor mechanical room 17, serves the pediatric unit, third floor A- wing. . The unit has return air and outside air capability but the quantities are not controlled. The room is utilized as a mixing plenum with outside air introduced through a louver installed in a window opening. The unit is in poor condition and should be replaced.
- Air handling unit AHU-15 is located in fourth floor mechanical room 19, serves the medical ward and physical therapy on the fourth floor, wings A and B. The unit has return air and outside air capability but the quantities are not controlled. The room is utilized as a mixing plenum with outside air introduced through a

louver installed in a window opening. The unit is in poor condition and should be replaced.

- Air handling unit AHU-16 is located in fifth floor mechanical room C-515, serves the surgical ward and urology clinics, fifth floor A-wing and B-wing. The unit has return air and outside air capability but the quantities are not controlled. The room is utilized as a mixing plenum with outside air introduced through a louver installed in a window opening. The unit is in poor condition and should be replaced.
- Air handling unit AHU-17 is located in fourth floor mechanical room `8 and serves second floor D-wing.
- Air handling u nit AHU-18 is located in the facility managers' office. This unit is a desiccant unit that formally served the orthopedic apparatus laboratory. This unit should be removed and replaced with a more appropriate system.
- A single air-handling unit could be installed to replace air-handling units AHU-13, 14, 15 and 16, utilizing the existing mechanical rooms as air shafts. Recommendation is replace all air handling units except Nos. 10, 11 and 12 along with associated blower-coil units, return fans and exhaust fans.
- Isolation rooms B222, A412, A414, A417 and A418 do not have adequate exhaust to maintain a negative pressure. New exhaust systems and controls should be provided to ensure containment.
- Autoclave room D233 needs to have an exhaust system installed.
- Operation of all humidifiers was questionable. Steam is provided directly from the high-pressure boilers, not a clean steam generator. Humidifiers should be replaced and a clean steam generator installed.
- All ductwork should be cleaned.
- Chillers are original equipment and utilize R-11 refrigerant. Machines are 2400 volt. Recommendation is to replace the chillers with R-123 or R-134 machines. Cooling towers and pumps are also original equipment and should be replaced. Consideration should be given to raising the tower sump elevation and installing the condenser water pumps indoors.
- High-pressure steam is provided form a remote central boiler plant and is piped to two main pressure reducing stations. Steam is used directly for heating hot water converters, humidifiers and domestic hot water generators. Some recent replacement work has been done on the pressure reducing station valves.
- The entire control system serving the facility needs to be replaced to allow proper operation of the equipment and maintain proper comfort conditions.
- Exhaust fans serving the laboratory are standard mushroom type general exhaust centrifugal fans and should be replaced with centrifugal type utility fans and minimum 8'0" discharge stacks.
- A dedicated cooling system(s) with year around capability needs to be considered for the laboratory and computer areas.
- The original cooling towers need to be replaced. Tower sump elevation should be increased to a minimum of four feet above the pump suction to eliminate potential cavitation. Basin heaters should also be considered or installation of a cool water concrete sump with turbine type pumps to eliminate freeze potential.

- Medical gas storage areas do not appear to meet code. Consideration should be given to relocating storage of medical gases to outside under a weather canopy. Oxidants and other gases need to be separated and secured with a locked fence. The bulk oxygen and back-up reserves are already stored outside.
- All piping systems are basically original and have been patched over the years. Recommendation is to replace all steam, condensate, heating hot water, chilled water and domestic water systems throughout the facility.

Electrical

- Nurse Call systems - Three different vendors.
- Cardiac Alert System (Code Blue) - "Guard Enterprises" - previously had many problems with this system but they have been corrected.
- Outdoor substation is fed overhead from two different directions. ??Kv:2.4Kv transformers feed 2.4Kv underground to hospital.
- North Addition has limited emergency power.
- There are seven ATS (Automatic Transfer Switches) and associated distribution panels and supposedly they are "maxed out" in capacity and spaces. Emergency panels in A & B wings occur only on alternate floors.
- One of two generators will handle the existing emergency load.
- Normal power is quite reliable.
- Switchgear for the Trane Centravac Chillers, 2.4Kv, is hazardous, interlock between sources is broken.
- ATS-1, Life Safety, is rated 225A but feeds 400A panel with approx. 400A load.
- Short Circuit Analysis & Coordination Study has not been done and is needed. Proper circuit breaker settings are unknown.
- Existing power distribution panels are located in the mixed air plenum of air handling units on floors 2 through 5. These panels do not have code required minimum clearance and are full. Recommend the installation of new larger panels with additional circuit capacity.
- Ground fault interrupting devices are required in all "wet" areas.
- Generators are two 350Kw, 480Y/277V, Cummins units. Exhausts are piped underground to a small "doghouse" some distance away. Running time is 150 hours and 750 hours. Emergency battery lighting unit in generator room.
- Main fuel storage is new 4000 gal underground tank with monitoring system for leakage.
- A 33Kw, 208Y/120V, Kohler generator was installed in the same room by the telephone vendor and serves only telephone equipment. It sits where a third hospital generator would have been located.
- New parking lot and site lighting is being installed by a DPW (Department of Public Works) contractor. This consists of medium height poles with HPS shoebox fixtures and HPS bollards. These fixtures replace an inadequate system of pole mounted mercury fixtures.
- Corridor lighting is adequate, consisting of either 2'x 4' acrylic lens troffers or 2'x 4' parabolic troffers with three T8 cool white lamps.

- Switches for egress lighting (life safety) are generally key type (or should be). Switches for emergency work lighting (critical) are regular toggle type. All switches for emergency lights have yellow painted cover plates.
- Fire Alarm system is "Honeywell" with new ADA compliant horn/strobes.
- Located in a small locked room near the front desk is the computer connected to the Fire Alarm System and the computer connected to the Cardiac Alert System.
- Newer exit signs have battery backup and are in good condition.
- Public Address System speakers are located throughout the facility and provide adequate coverage.
- Medical Gas Alarm panel is located at the front desk.
- Door Alarm panel by "Crest Electronics" is located at front desk.
- Closed Circuit Television (CCTV) monitors and switchers located at front desk.
- Stairs have emergency battery units for emergency lighting.
- General work areas throughout the building have older industrial reflector fluorescent strips or wraparound fluorescent fixtures that provide inadequate lighting levels.
- Original "blue" service switchgear is now used as a distribution board for the older areas of the building. The two main devices were removed, the tie breaker left in place and the gear is now fed by GE busway from the newer unit substation located in the next room. The ammeters indicate a load of 1100A @ 208V for each half of the board. Maintenance labels indicate this board was last tested by "H&H Testing" on 12-8-97. This board should be replaced.
- Newer panelboards in the original switchgear room by "GE" are in good condition. There are several NEC code violations regarding working clearances ("Main disconnect CT Scanner") which probably would be corrected by replacement of the original "blue" switchgear with physically smaller equipment.
- Several step-up transformers (208:480V) are installed to serve X-ray and other equipment.
- Unit substation (1975) by "GE" appears to be in good condition although lack of ventilation in the room causes overheating during warmer months. This double-ended equipment has 5 KV load interrupter switches for primary disconnects. Each transformer is rated 1000 KVA, 2.4KV): 208Y/120V, 55°C rise OA/FA. Insulating oil is the less flammable type, "R-Temp". A concrete dyke is installed for oil containment. Low voltage overcurrent devices are GE power circuit breakers. Main, tie and larger feeder breakers are electrically operated, smaller feeder breakers are manual. Ammeters indicate loads of 1800A & 1600A on each half of the board.
- Automatic transfer switches (ATS) are installed in a separate room. None of the ATSs have bypass switches. ATS #6 has aluminum wires terminated in mechanical lugs. Any aluminum wire should have compression type lugs or adapters installed to prevent overheating of connections.
- The emergency loads are not segregated by "branches" (Life Safety, Critical & Equipment) as presently required by NEC Article 517 and NFPA 110. They were originally, but renovations over the years have changed that so newer emergency loads were simply connected to whichever emergency panel was convenient.

- Emergency panelboards by "GE" are in fairly good condition, and are painted yellow for identification. It appears that the emergency panelboards were all replaced at one time.
- Normal panelboards by "Federal Engineering & Manufacturing Co" have ITE circuit breakers and are original equipment. Parts are increasingly hard to obtain and these panels have reached end of rated life. They should be replaced.
- Generator paralleling switchgear by "Russelectric" with distribution section by "GE" is in fairly good condition. All overcurrent devices are drawout power circuit breakers. Space is available for a third generator breaker. The manufacturer's description on the front of switchgear indicates three operating priorities for feeders - Highest Priority, Priority and Equipment. However, the actual feeder breakers are identified as:

EF2	Critical Distribution Panel	Priority 1	N/C
EF1	Life Safety Distribution Panel EPD-1	Priority 1	N/C
EF5	Fire Pump	Priority 1	N/C
EF4	Equipment Priority Distribution Panel	Priority 2	N/O
EF6	X-ray Panel IXR	Priority 2	N/C
EF3	Equipment Distribution Panel Delayed	Priority 2	N/O

- There is no indication of testing of this gear. A thorough examination and preventive maintenance including tests of proper operating sequences and timing should be performed.
- Chillers 1 & 2 are medium voltage machines and are fed from an indoor 2.4KV motor control service switchboard by "Allis-Chalmers". This original piece of gear is in poor condition and a serious safety hazard. Interlocks for manually switching between incoming sources are not operational. Doors covering live medium voltage parts are not kept locked. Replacement of this gear should be a priority.
- Mechanical/Electrical room (with chillers & generator switchgear) has inadequate iNCRndescent lighting. Should be replaced with new fluorescent fixtures.
- Typical small electrical closets throughout building (i.e.: Rm. C21B) have no NEC required working clearances in front of panelboards. Many of these closets are loaded with signal & communication equipment that has been added over the years.
- Cardiac Alert (Code Blue) System uses plain toggle switches with weatherproof covers as initiating devices.
- Kitchen has part of the equipment on emergency power.
- All panelboards throughout the building have detailed typed circuit directories dating from 1992.
- Pathology Dept - many extension cords used for equipment, quantity of receptacles are inadequate and the panels serving this area have no spares or spaces.
- Pathology Dept - Egress lights should not be controlled by a toggle switch (key switch or no switch would be acceptable).
- Radiology Dept - Well lit with new fixtures. (This department was recently renovated).
- Eye Clinic - Poor lighting.

- Pharmacy - Poor lighting, waiting area is quite dark.
- Orthopedics - Well lit with 2' x 4' parabolic troffers with two or three 3500°K T8 lamps. (newly renovated)
- Receptacles observed in all patient areas are Hospital grade as required.
- Emergency Dept - All receptacles in exam/treatment areas are on emergency power but the total quantity is inadequate. Some receptacles should be on normal power as is required by NEC.
- Emergency Dept - Each exam/treatment rooms have emergency battery lighting units and large two headed exam lights.
- Emergency entrance power doors not operating properly (apparently have never worked). Controls should be revised, possibly with manual pushbutton switches.
- Cord reels with receptacles are provided outside for ambulance aux power.
- Clinic - Elec/Tele/Data Rm NS105 - hot, needs cooling.
- Clinic - Toilets - Motion Detector switches inoperative.
- CT Scan Clinic - Well lit similar to radiology.
- Mech Rm C134 - Emergency lighting not operational, circuit breakers not identified.
- ICU Nurses Station - some receptacles on emergency power.
- ICU Typical Patient Rm - Headwall has 11 emergency receptacles and no normal (some are needed). One normal wall receptacle and no emergency wall receptacles (at least one is needed to prevent tripping hazard of monitor power cord).
- Labor & Delivery - Brightly lit with 4 lamp wraparound fluorescent.
- Roof - Lightning protection is only installed on highest parapet and is not connected to antennas and other equipment that projects above the parapet. A complete UL listed Master Labeled should be installed.
- Roof - No receptacles found for chiller maintenance.
- Penthouse - Elevator equipment is original "Barbee Curran Elevator Co, Inc".
- Penthouse - Elevator Machine Room (Staff) - piping and HVAC equipment in room is code violation.
- Penthouse - Elevator Machine Rooms - Need better lighting.

- The facility is concrete and masonry construction with 2-hour floors, exterior bearing walls and stairs. Per NFPA 251, the standard for Building Construction and Materials, the construction is consistent with Type I Construction.
  The facility has 5 stories above grade with a mechanical penthouse, & 1 story below grade.
- The 1st floor is primarily outpatient clinic occupancy and is classified as business occupancy per NFPA 101, Life Safety Code.
- The 2nd and 3rd floors are surgery and labor and delivery occupancies.
- The 4Th and 5Th floors are outpatient treatment areas and are classified as business occupancies.
- There is a standpipe system with the hose valve connections located in the corridor.
- The building is unsprinklered with the exception of a few storage rooms.
- The fire alarm is a hardwired system, which is tied directly to the fire department. The fire alarm annunciator panel does not provide clear, concise information for the hospital staff or the fire department. There are pull stations located at all the exits. Automatic smoke detectors are located in the elevator lobbies and in the elevator machine room for the purpose of recalling the elevators to the ground floor in the event of a fire. Automatic smoke detectors are also located at the doors in the smoke barriers that are on magnetic hold open devices. Heat detection devices are located in the mechanical rooms.
- The Statement of Conditions (SOC) reports the building as protected throughout with automatic smoke detectors. This is an incorrect statement. The smoke detectors are only located at the doors on magnetic hold open devices in the smoke barriers, the elevator lobbies, and the elevator machine room. The SOC should be corrected to reflect the true conditions of the clinic.
- The fire alarm annunciator panel should be replaced. The fire alarm annunciator panel assists the hospital staff, as well as the fire department, in locating the source of the fire. The fire alarm annunciator panel should be graphic in nature to quickly display the approximate location of the fire.
- The fire alarm panel should be protected with a smoke detector located in the vicinity of the panel per NFPA 72.
- Currently the life safety requirements are met with the existing building construction type, the existing fire alarm system, and the automatic sprinkler system installed in the limited areas. However, the fire alarm annunciator panel should be replaced and the entire facility should be sprinklered. The surgery and labor & delivery wards have patients which are limited in mobility or completely immobile and a defend in place strategy by the staff and the fire department would be greatly enhanced by the installation of an automatic sprinkler system and the addition of a graphic annunciator. The addition of an automatic sprinkler system would provide the fire department with increased protection when connecting to the existing standpipe system where the hose valves are currently installed in the corridors.

VWInternational w/ Tobey + Davis **DeWitt Army Community Hospital**

Project Estimates Ft Belvior, Virginia

Revision 01

	Renovation w/ Addition	Total Replacement Site w/ Infrastructure	Total Replacement Site w/ Infrastructure
Primary Facility			
Interior Renovation	$18,149,784	$0	$0
Exterior Renovation	$4,389,352	$0	$0
Systems Replacement	$16,875,000	$0	$0
Demolition	$1,104,378	$0	$0
New Construction	$11,314,059	$54,553,077	$54,553,077
Building Information Systems	$3,109,954	$2,700,000	$2,700,000
Total Facility Cost	**$54,942,527**	**$57,253,077**	**$57,253,077**
Supporting Facilities			
Information Systems Beyond 5FT Line	$0	$1,717,592	$1,717,592
Site and Infrastructure	$1,648,275.80	$3,200,000	$10,200,000
Central Plant	$0	$0	$0
Estimated Construction Cost	**$56,590,803**	**$62,170,670**	**$69,170,670**
Fixed Equipment	$2,625,000	$5,250,000	$5,250,000
Permits	$875,000	$1,500,000	$1,500,000
SIOH 5.7%	$3,225,676	$3,543,728	$3,942,728
Contingency	$5,659,080	$3,108,533	$3,458,533
Total Congressional Request	**$68,975,559**	**$75,572,931**	**$83,321,931**
Other Appropriations			
Movable Equipment	$4,395,402	$4,395,402	$4,395,402
Furniture	$3,571,264	$3,571,264	$3,571,264
Design Fees @ 6%	$3,395,448	$3,730,240	$4,150,240
Transition Costs			
Other Transition Costs	$7,500,000	$4,000,000	$4,000,000
MILCON Transition Costs	$8,720,000	$7,360,000	$7,360,000
O & M Project Related Costs	$2,300,000	$5,096,000	$5,096,000
Total Project Cost	[illegible]	**$103,725,838**	[illegible]

Appendix E

Economic Analyses
And
Sensitivity Analyses

Belvoir Project
ECONOMIC ANALYSIS

EXECUTIVE SUMMARY REPORT

PROJECT TITLE : Dewitt ACH
DISCOUNT RATE : 6.1%
PERIOD OF ANALYSIS : 27 Years
START YEAR : 2004
BASE YEAR : 2004
REPORT OUTPUT : Current Dollars

PROJECT OBJECTIVE : To determine best option for health facility upgrade at DACH.

ECONOMIC INDICATORS:

ALTERNATIVE NAME	NPV
1 Renovation	$80,163,081
2 New Construction	$98,827,265

ACTION OFFICER: MAJ Pamela Cluff
ORGANIZATION : US Army Health Facility Planning Agency

LIFE CYCLE COST REPORT

1 Renovation

	Major Repair	Equipment	Furnishings	Commo	Security
YEAR	(1)	(2)	(3)	(4)	(5)
2004	$51,832,572	$0	$0	$0	$300,000
2005	$0	$0	$0	$0	$300,000
2006	$0	$2,625,000	$0	$0	$300,000
2007	$0	$4,395,402	$3,571,264	$3,109,954	$300,000
2008	$0	$0	$0	$0	$0
2009	$0	$0	$0	$0	$0
2010	$0	$0	$0	$0	$0
2011	$0	$0	$0	$0	$0
2012	$0	$0	$0	$0	$0
2013	$0	$0	$0	$0	$0
2014	$0	$0	$0	$0	$0
2015	$0	$0	$0	$0	$0
2016	$0	$0	$0	$0	$0
2017	$0	$0	$0	$0	$0
2018	$0	$0	$0	$0	$0
2019	$0	$0	$0	$0	$0
2020	$0	$0	$0	$0	$0
2021	$0	$0	$0	$0	$0
2022	$0	$0	$0	$0	$0
2023	$0	$0	$0	$0	$0
2024	$0	$0	$0	$0	$0
2025	$0	$0	$0	$0	$0
2026	$0	$0	$0	$0	$0
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$0	$0	$0	$0	$0
%NPV	62.77	7.28	3.62	3.15	1.33
	$50,320,514	$5,836,500	$2,902,807	$2,527,843	$1,068,321
DISCOUNTING CONVENTION	M-O-Y	M-O-Y	M-O-Y	M-O-Y	M-O-Y
INFLATION INDEX	No Inflation	No Inflation	No Inflation	No Inflation	No Inflation

LIFE CYCLE COST REPORT

1 Renovation

YEAR	Maintenance and Repair (6)	Transition Planning/Mov (7)	TOTAL ANNUAL OUTLAYS	MIDDLE OF YEAR DISCOUNT FACTORS	PRESENT VALUE
2004	$840,922	$0	$52,973,494	0.971	$51,428,153
2005	$862,786	$0	$1,162,786	0.915	$1,063,964
2006	$885,219	$0	$3,810,219	0.862	$3,285,954
2007	$908,234	$3,400,000	$15,684,854	0.813	$12,749,016
2008	$931,849	$0	$931,849	0.766	$713,881
2009	$956,077	$0	$956,077	0.722	$690,332
2010	$980,935	$0	$980,935	0.681	$667,560
2011	$1,006,439	$0	$1,006,439	0.641	$645,538
2012	$1,032,606	$0	$1,032,606	0.605	$624,243
2013	$1,059,454	$0	$1,059,454	0.570	$603,651
2014	$1,087,000	$0	$1,087,000	0.537	$583,738
2015	$1,115,262	$0	$1,115,262	0.506	$564,482
2016	$1,144,259	$0	$1,144,259	0.477	$545,861
2017	$1,174,009	$0	$1,174,009	0.450	$527,854
2018	$1,204,534	$0	$1,204,534	0.424	$510,441
2019	$1,235,852	$0	$1,235,852	0.399	$493,603
2020	$1,267,984	$0	$1,267,984	0.376	$477,320
2021	$1,300,951	$0	$1,300,951	0.355	$461,574
2022	$1,334,776	$0	$1,334,776	0.334	$446,348
2023	$1,369,480	$0	$1,369,480	0.315	$431,624
2024	$1,405,087	$0	$1,405,087	0.297	$417,386
2025	$1,441,619	$0	$1,441,619	0.280	$403,617
2026	$1,479,101	$0	$1,479,101	0.264	$390,303
2027	$1,517,558	$0	$1,517,558	0.249	$377,428
2028	$1,557,014	$0	$1,557,014	0.234	$364,977
2029	$1,597,496	$0	$1,597,496	0.221	$352,937
2030	$1,639,031	$0	$1,639,031	0.208	$341,295
%NPV	18.39	3.45			
	$14,743,498	$2,763,599			
DISCOUNTING CONVENTION	M-O-Y	M-O-Y			
INFLATION INDEX	97 General Inflation	No Inflation			

LIFE CYCLE COST REPORT

1 Renovation

YEAR	CUMULATIVE NET PRESENT VALUE
2004	$51,428,153
2005	$52,492,117
2006	$55,778,071
2007	$68,527,086
2008	$69,240,968
2009	$69,931,300
2010	$70,598,860
2011	$71,244,398
2012	$71,868,641
2013	$72,472,292
2014	$73,056,030
2015	$73,620,512
2016	$74,166,373
2017	$74,694,227
2018	$75,204,668
2019	$75,698,272
2020	$76,175,592
2021	$76,637,166
2022	$77,083,514
2023	$77,515,139
2024	$77,932,524
2025	$78,336,142
2026	$78,726,445
2027	$79,103,872
2028	$79,468,849
2029	$79,821,787
2030	$80,163,081

6.1% DISCOUNT RATE, 27 YEARS

LIFE CYCLE COST REPORT

2 New Construction

YEAR	Initial Construction (1)	Equipment (2)	Furnishings (3)	Communica-tions (4)	Security (5)
2004	$54,553,077	$0	$0	$0	$0
2005	$0	$0	$0	$0	$0
2006	$0	$5,250,000	$0	$1,717,592	$300,000
2007	$0	$4,395,402	$3,571,264	$2,700,000	$300,000
2008	$0	$0	$0	$0	$0
2009	$0	$0	$0	$0	$0
2010	$0	$0	$0	$0	$0
2011	$0	$0	$0	$0	$0
2012	$0	$0	$0	$0	$0
2013	$0	$0	$0	$0	$0
2014	$0	$0	$0	$0	$0
2015	$0	$0	$0	$0	$0
2016	$0	$0	$0	$0	$0
2017	$0	$0	$0	$0	$0
2018	$0	$0	$0	$0	$0
2019	$0	$0	$0	$0	$0
2020	$0	$0	$0	$0	$0
2021	$0	$0	$0	$0	$0
2022	$0	$0	$0	$0	$0
2023	$0	$0	$0	$0	$0
2024	$0	$0	$0	$0	$0
2025	$0	$0	$0	$0	$0
2026	$0	$0	$0	$0	$0
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$0	$0	$0	$0	$0
%NPV	53.59	8.20	2.94	3.72	0.51
	$52,961,656	$8,100,314	$2,902,807	$3,675,884	$502,569
DISCOUNTING CONVENTION	M-O-Y	M-O-Y	M-O-Y	M-O-Y	M-O-Y
INFLATION INDEX	No Inflation	No Inflation	No Inflation	No Inflation	No Inflation

LIFE CYCLE COST REPORT

2 New Construction

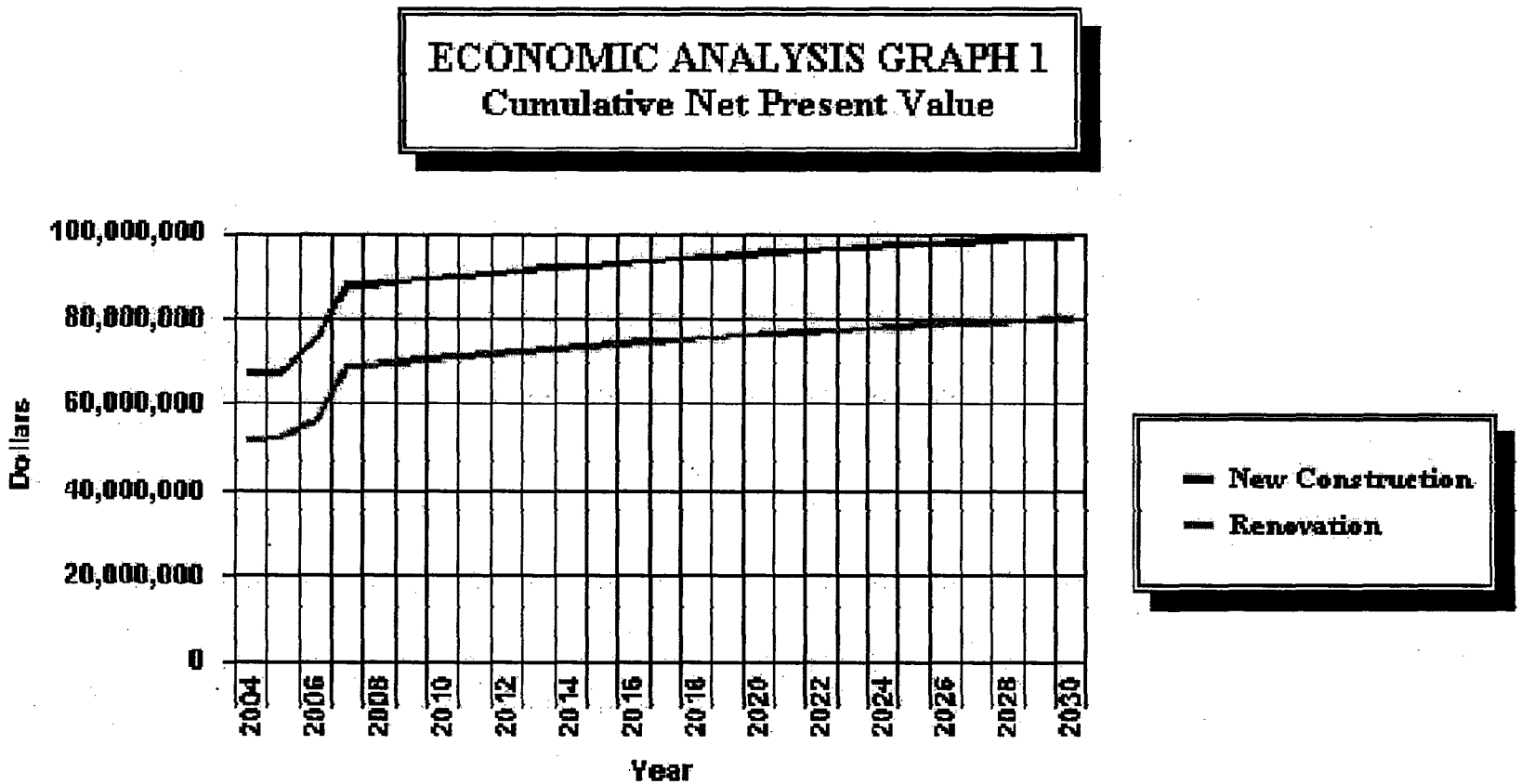
YEAR	Spt Info Systems (6)	Site Infrastructu (7)	Contingency (8)	Maintenance and Repair (9)	Transition Planning/Mov (10)
2004	$0	$10,200,000	$3,458,533	$840,922	$0
2005	$0	$0	$0	$862,786	$0
2006	$0	$0	$0	$885,219	$0
2007	$1,717,592	$0	$0	$908,234	$2,000,000
2008	$0	$0	$0	$931,849	$0
2009	$0	$0	$0	$956,077	$0
2010	$0	$0	$0	$980,935	$0
2011	$0	$0	$0	$1,006,439	$0
2012	$0	$0	$0	$1,032,606	$0
2013	$0	$0	$0	$1,059,454	$0
2014	$0	$0	$0	$1,087,000	$0
2015	$0	$0	$0	$1,115,262	$0
2016	$0	$0	$0	$1,144,259	$0
2017	$0	$0	$0	$1,174,009	$0
2018	$0	$0	$0	$1,204,534	$0
2019	$0	$0	$0	$1,235,852	$0
2020	$0	$0	$0	$1,267,984	$0
2021	$0	$0	$0	$1,300,951	$0
2022	$0	$0	$0	$1,334,776	$0
2023	$0	$0	$0	$1,369,480	$0
2024	$0	$0	$0	$1,405,087	$0
2025	$0	$0	$0	$1,441,619	$0
2026	$0	$0	$0	$1,479,101	$0
2027	$0	$0	$0	$1,517,558	$0
2028	$0	$0	$0	$1,557,014	$0
2029	$0	$0	$0	$1,597,496	$0
2030	$0	$0	$0	$0	$0
%NPV	1.41	10.02	3.40	14.57	1.64
	$1,396,099	$9,902,446	$3,357,641	$14,402,203	$1,625,647
DISCOUNTING CONVENTION	M-O-Y	M-O-Y	M-O-Y	M-O-Y	M-O-Y
INFLATION INDEX	No Inflation	No Inflation	No Inflation	97 General Inflation	No Inflation

LIFE CYCLE COST REPORT

2 New Construction

YEAR	TOTAL ANNUAL OUTLAYS	MIDDLE OF YEAR DISCOUNT FACTORS	PRESENT VALUE	CUMULATIVE NET PRESENT VALUE
2004	$69,052,532	0.971	$67,038,134	$67,038,134
2005	$862,786	0.915	$789,460	$67,827,594
2006	$8,152,811	0.862	$7,031,029	$74,858,623
2007	$15,592,492	0.813	$12,673,942	$87,532,565
2008	$931,849	0.766	$713,881	$88,246,446
2009	$956,077	0.722	$690,332	$88,936,778
2010	$980,935	0.681	$667,560	$89,604,338
2011	$1,006,439	0.641	$645,538	$90,249,876
2012	$1,032,606	0.605	$624,243	$90,874,120
2013	$1,059,454	0.570	$603,651	$91,477,771
2014	$1,087,000	0.537	$583,738	$92,061,509
2015	$1,115,262	0.506	$564,482	$92,625,991
2016	$1,144,259	0.477	$545,861	$93,171,852
2017	$1,174,009	0.450	$527,854	$93,699,706
2018	$1,204,534	0.424	$510,441	$94,210,147
2019	$1,235,852	0.399	$493,603	$94,703,750
2020	$1,267,984	0.376	$477,320	$95,181,070
2021	$1,300,951	0.355	$461,574	$95,642,645
2022	$1,334,776	0.334	$446,348	$96,088,993
2023	$1,369,480	0.315	$431,624	$96,520,617
2024	$1,405,087	0.297	$417,386	$96,938,003
2025	$1,441,619	0.280	$403,617	$97,341,620
2026	$1,479,101	0.264	$390,303	$97,731,923
2027	$1,517,558	0.249	$377,428	$98,109,351
2028	$1,557,014	0.234	$364,977	$98,474,328
2029	$1,597,496	0.221	$352,937	$98,827,265
2030	$0	0.208	$0	$98,827,265

6.1% DISCOUNT RATE, 27 YEARS


ECONOMIC ANALYSIS GRAPH 1
Cumulative Net Present Value
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
0
Dollars
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
Year
New Construction
Renovation

COST SENSITIVITY ANALYSIS 1

TITLE: CSA1

This sensitivity analysis checks for alternative 2 to be ranked least cost as a result of changes in the expense item(s) listed below:

ALTERNATIVE	EXPENSE ITEM(S)
2 New Construction	** NOTHING CHANGED **
1 Renovation	7 Transition Planning/

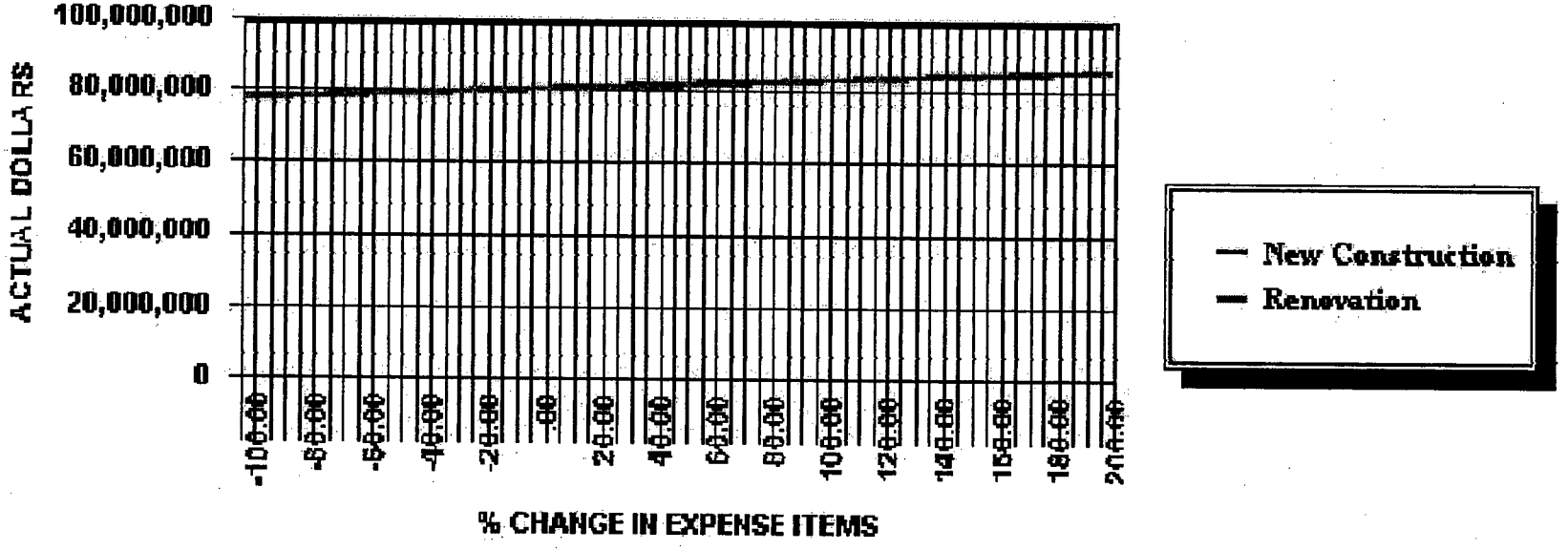
The selected expense items are allowed to vary from a value of -100.00% to 200.00%

ALTERNATIVE	NET PRESENT VALUE
1 Renovation	$80,163,081
2 New Construction	$98,827,265

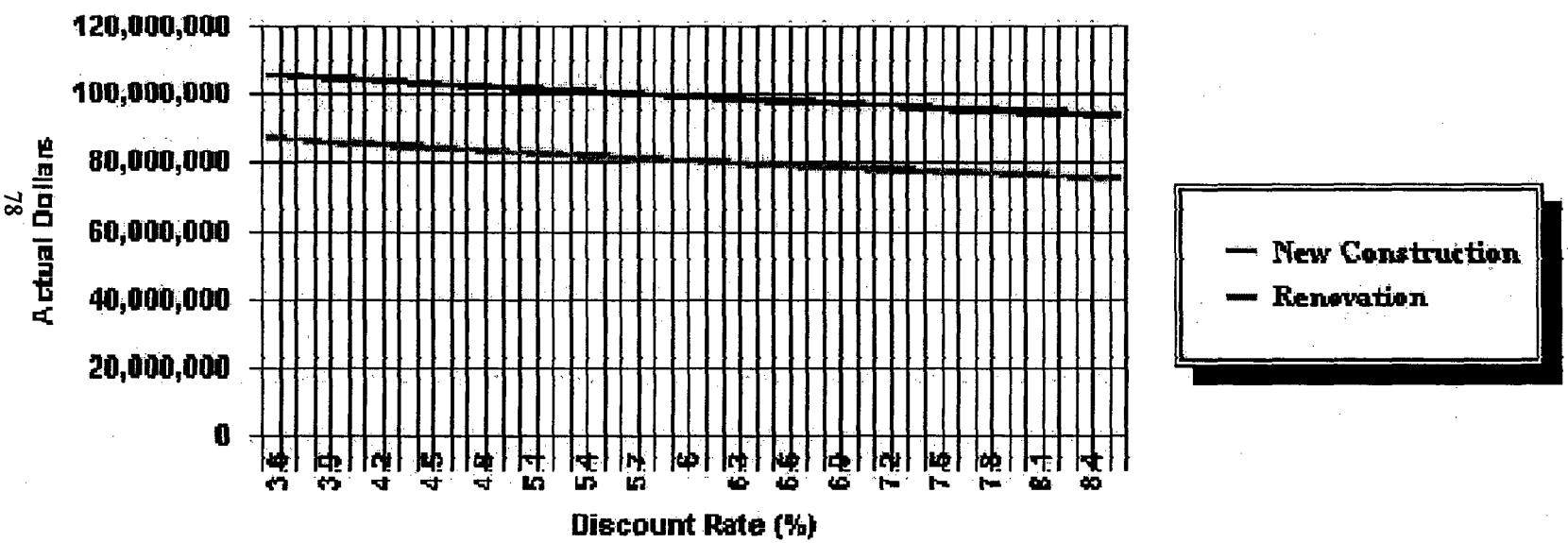
RESULTS:

The ranking of alternatives is insensitive to changes in the selected expense item(s), within the allowable range of variation.

COST SENSITIVITY ANALYSIS 1
CSA1
Graph of NPV vs. % change in expense items



DISCOUNT RATE SENSITIVITY ANALYSIS 1
DRSA1
Graph of Net Present Value vs. Discount Rate



DISCOUNT RATE SENSITIVITY ANALYSIS 1

TITLE: DRSA1

Summary of Alternative Rankings by Discount Rate

Discount Rate: 6.1 Lower Limit: 03.60 Upper Limit: 08.60

Discount Rate (%)	Alternative Ranking	Discount Rate (%)	Alternative Ranking
3.60	1 2	6.20	1 2
3.70	1 2	6.30	1 2
3.80	1 2	6.40	1 2
3.90	1 2	6.50	1 2
4.00	1 2	6.60	1 2
4.10	1 2	6.70	1 2
4.20	1 2	6.80	1 2
4.30	1 2	6.90	1 2
4.40	1 2	7.00	1 2
4.50	1 2	7.10	1 2
4.60	1 2	7.20	1 2
4.70	1 2	7.30	1 2
4.80	1 2	7.40	1 2
4.90	1 2	7.50	1 2
5.00	1 2	7.60	1 2
5.10	1 2	7.70	1 2
5.20	1 2	7.80	1 2
5.30	1 2	7.90	1 2
5.40	1 2	8.00	1 2
5.50	1 2	8.10	1 2
5.60	1 2	8.20	1 2
5.70	1 2	8.30	1 2
5.80	1 2	8.40	1 2
5.90	1 2	8.50	1 2
6.00	1 2	8.60	1 2
6.10	1 2		

RESULTS:

No change in the alternative ranking occurred.

DISCOUNT RATE SENSITIVITY ANALYSIS 1

le of Net Present Value for each Discount Rate

%	Disc Rate = 03.70%	Disc Rate = 03.80%	Disc Rate = 03.90%
	Alt - NPV	Alt - NPV	Alt - NPV
-	----------	----------	----------
2	1 - $86,638,239	1 - $86,323,635	1 - $86,013,508
4	2 - $105,402,119	2 - $105,086,829	2 - $104,775,646

%	Disc Rate = 04.10%	Disc Rate = 04.20%	Disc Rate = 04.30%
	Alt - NPV	Alt - NPV	Alt - NPV
-	----------	----------	----------
0	1 - $85,406,334	1 - $85,109,115	1 - $84,816,029
1	2 - $104,165,288	2 - $103,865,962	2 - $103,570,440

)%	Disc Rate = 04.50%	Disc Rate = 04.60%	Disc Rate = 04.70%
	Alt - NPV	Alt - NPV	Alt - NPV
--	----------	----------	----------
)7	1 - $84,241,937	1 - $83,960,774	1 - $83,683,431
51	2 - $102,990,526	2 - $102,705,996	2 - $102,424,994

)%	Disc Rate = 04.90%	Disc Rate = 05.00%	Disc Rate = 05.10%
	Alt - NPV	Alt - NPV	Alt - NPV
--	----------	----------	----------
33	1 - $83,139,909	1 - $82,873,588	1 - $82,610,800
54	2 - $101,873,314	2 - $101,602,510	2 - $101,334,981

0%	Disc Rate = 05.30%	Disc Rate = 05.40%	Disc Rate = 05.50%
	Alt - NPV	Alt - NPV	Alt - NPV
--	----------	----------	----------
78	1 - $82,095,555	1 - $81,842,968	1 - $81,593,651
68	2 - $100,809,511	2 - $100,551,454	2 - $100,296,440

0%	Disc Rate = 05.70%	Disc Rate = 05.80%	Disc Rate = 05.90%
	Alt - NPV	Alt - NPV	Alt - NPV
---	----------	----------	----------
45	1 - $81,104,587	1 - $80,864,719	1 - $80,627,883
14	2 - $99,795,322	2 - $99,549,113	2 - $99,305,733

0%	Disc Rate = 06.10%	Disc Rate = 06.20%	Disc Rate = 06.30%
	Alt - NPV	Alt - NPV	Alt - NPV
---	----------	----------	----------
22	1 - $80,163,081	1 - $79,935,006	1 - $79,709,743
34	2 - $98,827,265	2 - $98,592,078	2 - $98,359,527

DISCOUNT RATE SENSITIVITY ANALYSIS 1

TITLE: DRSA1

Table of Net Present Value for each Discount Rate

Disc Rate = 06.40%		Disc Rate = 06.50%		Disc Rate = 06.60%		Disc Rate = 06.70%	
Alt -	NPV	Alt -	NPV	Alt -	NPV	Alt -	NPV
1 -	$79,487,241	1 -	$79,267,449	1 -	$79,050,317	1 -	$78,835,797
2 -	$98,129,563	2 -	$97,902,143	2 -	$97,677,222	2 -	$97,454,756

Disc Rate = 06.80%		Disc Rate = 06.90%		Disc Rate = 07.00%		Disc Rate = 07.10%	
Alt -	NPV	Alt -	NPV	Alt -	NPV	Alt -	NPV
1 -	$78,623,841	1 -	$78,414,402	1 -	$78,207,436	1 -	$78,002,897
2 -	$97,234,703	2 -	$97,017,020	2 -	$96,801,668	2 -	$96,588,606

Disc Rate = 07.20%		Disc Rate = 07.30%		Disc Rate = 07.40%		Disc Rate = 07.50%	
Alt -	NPV	Alt -	NPV	Alt -	NPV	Alt -	NPV
1 -	$77,800,741	1 -	$77,600,927	1 -	$77,403,413	1 -	$77,208,157
2 -	$96,377,795	2 -	$96,169,196	2 -	$95,962,772	2 -	$95,758,487

Disc Rate = 07.60%		Disc Rate = 07.70%		Disc Rate = 07.80%		Disc Rate = 07.90%	
Alt -	NPV	Alt -	NPV	Alt -	NPV	Alt -	NPV
1 -	$77,015,119	1 -	$76,824,261	1 -	$76,635,544	1 -	$76,448,930
2 -	$95,556,303	2 -	$95,356,186	2 -	$95,158,102	2 -	$94,962,015

Disc Rate = 08.00%		Disc Rate = 08.10%		Disc Rate = 08.20%		Disc Rate = 08.30%	
Alt -	NPV	Alt -	NPV	Alt -	NPV	Alt -	NPV
1 -	$76,264,382	1 -	$76,081,866	1 -	$75,901,344	1 -	$75,722,784
2 -	$94,767,894	2 -	$94,575,705	2 -	$94,385,416	2 -	$94,196,997

Disc Rate = 08.40%		Disc Rate = 08.50%		Disc Rate = 08.60%	
Alt -	NPV	Alt -	NPV	Alt -	NPV
1 -	$75,546,150	1 -	$75,371,411	1 -	$75,198,533
2 -	$94,010,416	2 -	$93,825,643	2 -	$93,642,650